

MIT's SC2020 Project

The Essence of EXCELLENCE

By Larry Lapidé

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MIT's Supply Chain 2020 Project shows that true supply chain superiority does not come by emulating the best practices of others. Rather, it flows from leveraging a strategic framework and deeper set of guiding principles that lead to competitive advantage for your company. This is the notion of the "competitive-principled" supply chain. Here's a look at the framework and principles that can form the core of supply chain excellence.

Since ancient times, military strategists, civic planners, and global traders have all viewed integrated logistics as strategically important. But it is only within the last dozen years that the corporate world has begun to acknowledge supply chain management as a discrete discipline that is essential to a sound business strategy. Much of this recent realization has been sparked by the widely publicized successes of companies such as Toyota, Wal-Mart, and Dell. Each has effectively demonstrated that back-office functions can be turned inside-out to help win the long-term business battles being fought by front-office sales and marketing staff.

The visibility of those companies' achievements has encouraged supply chain managers from many other industries to benchmark against their practices and to try to apply some of the practices in their own organizations. Unfortunately, such best-practice emulation rarely works well. Toyota's approach to supply chain superiority is not the same as Dell's or Wal-Mart's. One size does not fit all; not only are there obvious differences between the automotive industry and the high-tech sector, but the companies themselves operate quite different supply chains and compete in different ways. So this begs a more interesting question: What exactly is an excellent supply chain?

The Center for Transportation & Logistics at the Massachusetts Institute of Technology (MIT) is striving to answer that question. Last year, we launched a multi-year research project that we call Supply Chain 2020 (SC2020).



performance metrics, and practices are aligned in a strategic framework. These supply chains leverage core principles to establish a high degree of competitive differentiation.

Rethinking the Meaning of “Excellence”

Early in the SC2020 project, the research team wrestled with the concept of excellence. We knew that our SC2020 team was not the first to investigate the idea of the “excellent” supply chain. Various business publications and more than a few consultants have bandied the concept around over the last several years. Some have even gone so far as to rank high-performing supply chains based mostly on financial and qualitative criteria. We believe, however, that those rankings are fundamentally flawed.

For example, many observers would argue that a company that has succeeded financially for many years must have an excellent supply chain

The project hopes to identify the factors that will be critical to the success of future supply chains. It will also map out the process innovations that will underpin successful supply chains as far into the future as 2020. The first phase of our project, completed in the summer of 2005, has begun to answer the “what” question: What makes successful supply chains tick? The second phase, now underway, is attempting to answer the “why” and the “how” questions.

We hope that part of the work of the SC2020 Project will be to take the emphasis off best practices. It is not our intent to dismiss the value of best-practice benchmarking in the right context. But it concerns us that managers continue to search fruitlessly for the “silver bullet” practice that they expect will transform their organizations into the next Toyota or Dell.

What we are finding so far is that there is a strategic framework and a set of deeper guiding principles—not best practices—that underpin supply chain superiority. This article introduces the concept of “the competitively principled” supply chain—one in which strategies, operating models,

while those that have done poorly have supply chains that perform poorly. However, although there are broad linkages, there is no direct correlation. A company can turn in outstanding financials despite having lackluster supply chain capabilities. A host of companies live off their robust brand names and their prowess in marketing and sales.

Such was the case for clothing manufacturer Levi Strauss during the 1980s. Worldwide demand for its branded jeans frequently outstripped supply. The jeans flew off retailers’ shelves faster than Levi’s could provide them, creating scarcity that further burnished its brand image. The company was highly profitable then, extracting high margins based on the brand’s global mystique.

In contrast, a company that is struggling financially might have an excellent supply chain if it is aligned to meet corporate goals or if the supply chain is designed to help it survive financial ups and downs. For example, Internet retailer Amazon.com was losing money during its early years—a time when it was creating an innovative supply chain to support its emerging business model. The company’s develop-

ment involved substantial investment in the physical infrastructure needed to fulfill a large number of small orders shipped by parcel. It also established several highly efficient distribution centers that could handle orders for a broad range of items picked at a warehouse as “one-offs.” Since then, of course, Amazon has become profitable, bolstered by an excellent supply chain that both supports and enhances its business strategy.

So if supply chain excellence cannot be defined simply by strong financial performance, what’s a better way? Consultants and analysts often define excellent supply chains as those that leverage so-called best practices and technologies—for example, the most effective and efficient use of key performance metrics, or the most consistent collaborative planning with suppliers, or the smoothest integration with new product development. However, realistically, there is no such thing as a “best” practice; best practices only work under certain business conditions in certain industries. Dell’s direct-sell, build-to-order business model does not directly apply to other industries such as brick-and-mortar retail businesses like Wal-Mart and Tesco. Indeed, it does not even apply to all segments of the computer hardware business. To supply sophisticated high-end computer servers and services to large businesses that operate global and complex technology networks, IBM’s high-touch customer service model is more apropos.

Some months into our research, we noticed a shift in the conversation. Our research had started out with a focus on best practices. But as more and more findings came in, the concepts of “tailored practices” and “underlying principles” surfaced in our discussions. We began to think about viewing SCM excellence “top down”—from the strategic level down to the practices and their underlying core principles that could be taught, encoded, and implemented. The principles would, we hoped, answer fundamental questions such as: What really makes this supply chain so effective? What trade-offs are being made?

Today, with the completion of the phase-one intelligence-gathering and analysis, our SC2020 research has determined that an excellent supply chain is essentially a “competitively principled” supply chain. The supply chain’s operation is guided by principles along at least two dimensions. First, the supply chain is strategically designed and operated according to an “excellent supply chain framework” (addressed below), which ensures alignment between supply chain business practices and the

competitive strategy of the overall business. (See Exhibit 1.) Second, excellent supply chain managers recognize and act on the idea that they need to adhere to the intent of the supply chain strategy. They don’t exhibit a “silo” mentality, and they distinguish between those operations that have to be best-in-class when compared to competitors and others that need to be only par. Therefore, trade-offs need to be made among departments in terms of the effort expended and resources applied. These trade-offs need to align with the competitive strategies in place.

Putting it another way, excellent supply chains have an intended focus and purpose, and excellent supply chain managers understand, act on, and respect those intentions.

Framework for Excellence

Qualitative research during phase one of SC2020 delved into nine industries’ drivers and challenges and the supply chain responses to them. In addition, the supply chains of 21 case-study companies were profiled to identify the important linkages that exist among competitive strategies, operating models, operational performance objectives, and business practices. The research supported the premise that an excellent supply chain:

1. Supports, enhances, and is an integral part of a company’s competitive business strategy.
2. Leverages a supply chain operating model to sustain a competitive edge.
3. Executes well against a balanced set of competitive operational performance objectives.
4. Focuses on a limited number of “tailored” business practices that reinforce each other to support the operating model and best achieve the operational objectives.

While these four characteristics sound relatively straightforward and easy to put in place, they are not. It takes years to mesh the elements together—and a great deal of effort to

alter them as the competitive landscape changes over time. If you were to start from scratch to build an excellent supply chain, you would start on the first characteristic, which is strategic in nature. You would then work sequentially down the list above to those characteristics that are more tactical and operationally oriented. In the course of doing this, upper-level characteristics might have to be revisited. You would follow a similar process if you were trying to drive an existing supply chain toward excellence.

It’s valuable to look at key aspects of the characteristics in detail, moving from the top level down.



Aligning the Operating Model

The first three characteristics in the excellent supply chain framework are interrelated and deal with alignment to a competitive business strategy (See upper box in Exhibit 1). In an excellent supply chain, the business strategy and its relevant elements need to be explicit and clearly understood by supply chain managers. At the same time, the supply chain operating model should not only support the business strategy but also be a major element in enhancing that strategy. The model needs to help the company carve out the markets in which it chooses to dominate. It also needs to continually realign itself as strategies evolve. Exhibit 2 depicts a potential list of supply chain-related elements that could be part of a competitive business strategy. The elements not only dictate what the operating model needs to do to support them but also reflect the operating model characteristics that are needed to enhance the overall business strategy.

EXHIBIT 2

Competitive Strategy Elements and Supporting Model Characteristics

Competitive Strategy Elements	Examples of Operating Model Characteristics That Support Strategy Elements
Lowest prices	Lowest operating costs
Highest margin products	Maximum availability at point of sale
Highest quality	Highest quality of suppliers Strongest manufacturing quality controls
Fastest customer response	Shortest order-to-delivery cycle Fastest request-to-promise date
Most innovative	Most efficient new product launch
Highest return-on-assets	Highest plant utilization Lowest inventories
Broadest product line	Adept at managing complexity
Best customer service	Specific service for each customer segment Maximum availability at point of sale
Best post-sales support	Maximum availability of service parts
Most environmentally responsible	Minimize waste and maximize recycling

Wal-Mart, Dell, and Cisco Systems have supply chain operating models that are aligned to both support and enhance their business strategies. Wal-Mart's corporate strategy over time has been to be the everyday lowest-priced retailer for cost-conscious customers. To do this, the retailer has shifted its operating model to distribute goods to store shelves at the lowest cost, helping to ensure that it can consistently price lower than local competition.

Part of the Wal-Mart operating model involves operating large stores that leverage a limited number of formats. These big stores, which are supplied by large distribution centers, yield economies of scale and efficient asset utilization, resulting in lower long-term operating costs. Wal-Mart tends to stay away from fickle-demand fashion items, choosing instead to market limited assortments of low-risk, faster-moving items

that are more certain to sell. This also helps the retailer to avoid the costs of merchandizing and promoting products.

For its part, Cisco Systems' business strategy is to be the dominant leader in the data-networking market by selling world-class end-to-end IT solutions. The communications-equipment company's operating model includes the rapid integration of technology-rich acquisitions—more than 100 during its history. This keeps Cisco's R&D costs low and its margins high while offering advanced technology to its customers. The operating model focuses on the new product introduction process to help maintain its technology leadership edge. It involves outsourcing its supply chain operations to partners, such as Jabil Circuit, the electronics-manufacturing-services provider that builds Cisco's modular switching equipment.

Exhibit 3, on page 22, summarizes Cisco's operating model and framework and those of other supply chain leaders studied by the SC2020 research teams.

Balancing Performance Objectives

The constant pursuit of operational excellence is a necessary ingredient for excellent supply chains—albeit difficult to pin down in an objective way. Operations managers constantly look to improve supply chain performance, especially to achieve operational excellence. Excellent supply chain managers formally and frequently check on the outputs. They measure how well the supply chain is doing, and they keep applying continuous improvement methods to raise the stakes.

Yet while a supply chain might execute well, that in and of itself does not make it excellent. Trying to do all things well or focusing on things that are not as important is not part of operational excellence. Excellence is about doing well at what matters most—the things that matter to stay competitive. For example, in fashion product businesses, it is misguided to focus too much on reducing inventories; there, high product availability is more important to achieving profitability goals.

An excellent supply chain must execute well against a set of operational performance objectives and metrics that match its business goals. Some supply chains, such as Wal-Mart's and Dell's, need to be highly efficient to keep costs low and to stay price-competitive. Others are designed to place greater focus on being responsive, with less focus on costs. (See Exhibit 3.) IBM is an example of a company that needs to focus on customer responsiveness to capture sales for its high-margin products and services (possibly at the expense of maintaining higher inventories and operating costs). IBM needs to do this to maximize margins generated over the total life of its customer relationships.

To assess which operational performance objectives to emphasize, it's useful to group them into three types, as shown in Exhibit 4, on page 33.

1. Customer Response. These include measures such as order cycle time, perfect order fill rates, product quality, and new product time-to-market that assess the perfor-

mance of the customer-facing operations of a supply chain. (Note that metrics of this type do not directly relate to the metrics on a company’s financial statements.) Companies in industries with high-margin, short-life-cycle products often emphasize these types of objectives; examples include the pharmaceutical, fashion apparel, and media and entertainment industries.

2. Efficiency. These operational performance measures are internal; they assess how well a supply chain converts inputs into outputs. Examples include labor productivity, labor content, supply chain costs, and waste. (Note that these metrics relate directly to metrics on the income statement.) Cost-conscious companies such as food and beverage, basic-goods retail, and industrial supplies often focus on these types of objectives.

3. Asset utilization. These operational measures are also internal. However, they focus on how effectively assets such as facilities and inventories are being used. (They relate directly to the balance sheet.) For example, capital-

intensive companies such as semiconductor fabricators and petrochemicals producers generally run around the clock to maximize the use of their expensive production equipment.

Common supply chain metrics that fall into each of these categories include: costs, which measure efficiency; fill rates, which measure customer response; and inventory turns, which measure asset utilization. Use of several types of metrics requires trade-offs—for instance, improving fill rates often requires higher inventories and increased costs.

A competitive strategy calls for using a balanced set of operational performance metrics that purposefully puts varying emphasis on metrics from each of these three types—placing greater focus on some and less on others. As depicted in Exhibit 4, the trade-offs are necessary in order to place the focus (represented by the small circle’s position in the triangle) in alignment with the business strategy and the operating model.

EXHIBIT 3

Case Studies of Successful Supply Chains

Company/ Industry	Strategy	Operating Model	Ranked Performance Objectives *	Set of Tailored Practices
Dell/High Tech (Computers)	Highest value-to-price provider of computers and accessories to price-conscious customers.	Direct sales to customers via Web/phone. Build-to-order manufacturing. Box-level service.	1. Efficiency (e.g., costs) 2. Asset utilization 3. Customer response	Consigned inventory supplier hubs. Demand shaping. Inbound transportation collaboration.
IBM/ High Tech (Computers)	Diversified and value-added provider of networked technology solutions to businesses.	Direct, single face to customer via sales reps. Build-to-order manufacturing. Extensive pre- and post-sales support.	1. Customer Response (e.g., satisfaction and sales rep efficiency) 2. Efficiency 3. Asset Utilization	Consolidated customer fulfillment process. Launch "buffer" manufacturing. Centralized procurement. Consolidated and outsourced logistics.
Cisco Systems/ High Tech (Communications Equipment)	Market world-class IT solutions. Be industry leader in the data-networking market. Become end-to-end solution provider.	Outsourced supply chain leveraging partners. World-class new-product-introduction process. Facilitate rapid integration of technology-rich acquisitions.	1. Efficiency (Costs) 2. Customer response 3. Asset utilization	Virtual supply chain. Partner visibility into end-to-end processes. Early design engagement. Operating standards to support rapid assimilation of acquired companies.
Wal-Mart/Retail	Everyday low pricing for cost-conscious customers.	Lowest-cost, brick-and-mortar retailer with supplier/retailer DC-to-store flows. Large-format stores carrying a wide variety of products (not necessarily brands and SKUs).	1. Efficiency (e.g., supply chain costs) 2. Asset utilization 3. Customer response	Vendor collaboration with co-managed inventory programs. Flow logistics distribution including cross-docking, direct-store-delivery, and differentiated flow. Network design incorporating large-sized DCs and short-haul private fleets for economies of scale.
Amazon/Retail	Be the largest one-stop shopping site on the Internet. Offer customers low prices, convenience, and a wide selection of merchandise.	Internet retail with unit-level picking, packing, and parcel fulfillment. Multi-tier network of inventories for distributed fulfillment from partners to offer scale and scope.	1. Customer response (e.g., availability) 2. Efficiency 3. Asset utilization	Drop-ship fulfillment from multi-tier partner network. Advanced batched-order warehouse picking, packing, and shipping strategies. Customer lead-time service-window management.
Limited Brands/ Fashion Apparel Retail	Sell innovative, technologically advanced, high-margin fashion products. Reduce risk by balancing basics vs. fashion mix.	Control supply chain operations from plants to DCs to owned stores. High shelf availability at store level.	1. Customer response (e.g., responsiveness) 2. Asset utilization / efficiency	Segmented fashion vs. basic supply chains. Captive global sourcing company. Captive, shared-services logistics provider--from plants to stores.

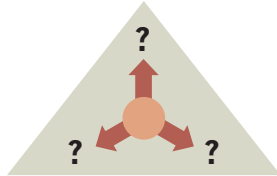
*Note: Performance objectives ranked by the competitive focus placed on each type, with examples for the highest focus.

EXHIBIT 4

Aligning Operational Performance to Business Goals

Customer Response (Customer-Facing)

- Order Cycle Times
- Perfect Order Fulfillment
 - Quality
- New Product Time-to-Market (Not on Financial Statements)



Efficiency (Internal)

- Labor Productivity
- Supply Chain Costs (Relate to Income Statements)

Asset Utilization (Internal)

- Facility Utilization
- Inventory Turns
- Cash-to-Cash Cycle (Relate to Balance Sheet)

Tailoring Practices

The fourth characteristic of an excellent supply chain is its focus on a limited number of business practices that reinforce one another and are in alignment with the operational objectives. Excellent supply chains avoid the trap of trying to do everything well because then nothing is done well. To be excellent, a supply chain focuses its resources on the inputs that matter most and applies only adequate resources to those areas that are not as important to the strategy and operating model. Practices are tailored to be consistent, reinforcing, and cross-optimized.

These tailored practices need to be integrated so that the whole system of tailored practices is greater than the sum of the parts. This set of tailored business practices is what management strategist Michael Porter terms the “activity system” necessary to maintain competitive advantage.

In excellent supply chains, a practice is “best” when it fits in a set of tailored practices to support a competitive strategy. This means that “best” is dependent on industry characteristics as well as the competitive position that one is trying to achieve. Consider Dell. Its tailored practices include the use of consigned inventory supplier hubs that feed their assemble-to-order manufacturing operations. This practice allows the company to hold minimal inventory and provides Dell with the benefits of a negative cash-to-cash cycle—so Dell gets paid by its customers before it has to pay its suppliers. (See Exhibit 3.) While forcing suppliers to carry the risks associated with holding inventory might seem harsh, other aspects of Dell’s tailored practices mitigate this risk. One is supplier collaboration, in which Dell provides suppliers with real-time demand signals. Dell also links its back-end operations to its Web site, which allows the company to shape demand. The products offered and promoted on the Web site are changed daily based on inventories in the supplier hubs. This assures suppliers that their inventories will not sit idle for long.

These tailored practices work extremely well for Dell.

They would make far less sense for a brick-and-mortar retailer like Wal-Mart. Instead, Wal-Mart’s tailored practices include leveraging economies of scale in its network design and creating a highly-automated, differentiated logistics flow enabled by the extensive use of technology. Although Wal-Mart’s practices also include supplier collaboration and the sharing of demand signals, they don’t involve supplier hubs because product needs to flow more rapidly throughout the retailer’s vast distribution system than supplier hubs would allow. Even though it is in the same industry, IBM also cannot just replicate Dell’s best practices in its own tailored practices. For its high-end server business, IBM sells globally, with sales reps taking orders that are more complex than Dell’s and have much longer selling cycles. So, for example, while IBM does some type of demand-shaping, it is more complicated (often on a deal-by-deal basis) compared to Dell’s, which involves changing a Web site.

An Introduction to Operating Principles

To really understand tailored practices, however, it is crucial to understand the underlying principles. A basic premise of the SC2020 study is that there is a set of time-independent immutable operating principles that underlies all supply chain best practices. In other words, while practices may change over time and across industries and between companies, the operating principles will not.

Our SC2020 project team is currently working on identifying the most important operating principles—the parts of the toolkit, if you will—now at work in today’s best practices. This, in turn, will help identify the innovative practices that will need to be in place by 2020. We know we haven’t identified them all yet; but we’ll discover more as the project progresses.

To illustrate how a best practice in use today leverages these underlying principles, let’s look at them within the context of the best practice of supply chain integration. During phase one of the SC2020 Project, we analyzed 25 quantitative studies from consultants, analysts, and academics to assess how company performance is affected by supply chain management practices. The research revealed that supply chain integration practices—both internal and external—provide the strongest correlation with short-term financial metrics and market share. Let’s look at how this key practice is leveraging six underlying operating principles for advantage.

1. Expand the Sphere of Influence. This principle comes into play when a dominant company increases its sphere of influence over its operations or those of its partners; generally all parties then tend to act in the interest of the company. When a company integrates its operations internally or vertically, it is strongly broadening its span of management control. It can be applied externally too; Wal-Mart’s collaboration with its suppliers is a good example of this. Wal-Mart provides suppliers with point-of-sale (POS) data on their products via its RetailLink system. Target has a similar program. By providing information that their suppliers need to help with their plan-

ning and forecasting, these retailers are increasing their influence (albeit on a low level) over the suppliers.

2. Increase Transparency. By increasing visibility throughout the supply chain, participants can better manage it. Collaboration between a supplier and customer in which data is shared on a one-way basis increases transparency along a supply chain. For example, while historical POS data from RetailLink helps to increase Wal-Mart's influence

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over its suppliers, the suppliers in turn are getting more information on Wal-Mart's needs. Generally, increased transparency can aid in better forecasting of demand and supply among supply chain partners. Dell and Wal-Mart both provide their suppliers with forecasts of their needs out to 13 weeks or more.

3. Relax Constraints. If a supply chain constraint is removed or relaxed, it can lead to more optimized operations. Often in collaborative relationships, the customer shows more flexibility. For example, a customer might agree to accept deliveries within a window of time rather than at a fixed time. In this case, its supplier can better optimize its operations because the delivery constraints for the customer's orders have been relaxed. The supplier now has more options with which to optimize the delivery of all of its customer orders, using techniques such as increased load consolidation.

4. Match Supply with Demand. This principle involves balancing supply and demand over time in order to satisfy demand, optimize operations, and minimize wasted resources. It is predicated on the realization that marketing and sales decisions made jointly with supply chain operations provide better outcomes than decisions made by each organization in isolation. The sales and operations planning process, an internal integration process practiced at many companies, applies this principle to tactical planning. Dell's demand-shaping practice uses it on a short-term, execution basis. In addition, a collaborative planning, forecasting, and replenishment program that includes joint forecasting and planning between a supplier and customer also uses the principle.

5. Trade off Inventory Against Cycle Time. Supply chain integration practices that reduce the cycle time of the ordering and fulfillment process—by using the Internet or other electronic channels, for instance—also reduce the inventories being held. For example, co-management inventory programs utilize continuous replenishment processes that take time out of the process, hence reducing inventory.

6. Use Supply Contracts. This principle involves using gain-sharing arrangements to provide a customer with an incentive to increase the sales of the supplier's product




beyond that provided by the customer's own margin contribution. For example, Blockbuster Video and the movie studios leverage the supply-contract operating principle in their business relationships. The studio sells a movie to Blockbuster at a heavily discounted price with an understanding that it will receive a portion of the rental revenue. In this manner, Blockbuster Video can buy more copies of a movie for the same investment as it could before the sharing of revenues. Moreover, it can increase revenue by fulfilling more requests thanks to higher availability.

As the examples cited demonstrate, supply chain operating practices can leverage a variety of principles depending on how they are implemented. So it is important to identify all the operating principles being leveraged by a particular practice because they provide the basis for assessing the cost-benefits of that practice. They also help gauge whether the practice is consistent with, reinforces, and cross-optimizes the company's other practices. In this regard, tailored practices work best when the operating principles being leveraged by them support similar resource trade-offs and target similar performance objectives.

Leveraging the Principles

These days, it is extremely important to think about leveraging operating principles rather than best practices. Best practices change over time, but the principles upon which the practices are based do not. Indeed, supply chain practices can eventually become obstacles to meeting corporate goals.

Therefore, to have an excellent supply chain—a competitively principled one—it is important for supply chain managers to create an evolving set of tailored practices based on understanding the operating principles being leveraged by them. These practices must also operate within the context of the "excellent supply chain framework." This understanding will help managers to develop the executive-level business cases needed to drive change.

That is why the SC2020 Project is currently identifying the operating principles applied in today's excellent supply chains. The next phase of the research promises to be rewarding. We expect to learn much about the contours of tomorrow's supply chains as we start to understand what external factors and business demands will shape them. And we expect to gain a clearer picture of what companies will have to do to prepare for that future. 

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