

Proceedings of the Supply Chain 2020 Project's Industry Advisory Council Kickoff Meeting



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1. Executive Summary

Project Introduction

The Supply Chain 2020 project (SC2020) is a multiyear research effort to identify and analyze the factors that are critical to the success of future supply chains. This pioneering project will map out the innovations that underpin successful supply chains out to the year 2020.

Initiated by the MIT-Zaragoza International Logistics Program, the global research project involves dozens of faculty, research staff, and students at MIT and other institutions around the world. The Industry Advisory Council (IAC), made up of supply chain executives from leading companies, plays a crucial role in helping to shape the work and generate new ideas.

By looking further into the future than most business research initiatives, the SC2020 project hopes to deliver practical breakthroughs on the design and management of future supply chains. The project also aims to help companies understand the forces that are changing supply chains so that they can be better prepared for the future. This work can create value in society through improvements in transportation, logistics and supply chain management practices.

SC2020 research is broad and far-reaching, and designed to meet a series of objectives in two phases. The objective of Phase 1 is to understand excellent supply chains and the underlying processes, principles, and macro forces that drive them. Leveraging what is learned during the first phase, Phase 2 of the research will project the future using scenario generation and analysis methodologies. As well as leading to a better understanding of future successes in supply chain management, the work will highlight what actions organizations should take to help ensure supply chain excellence.

The first meeting of the IAC, held on May 24, 2004 at MIT, sought insights from the supply chain executives. The IAC members and representatives from MIT discussed the nature of excellent supply chains and metrics for assessing supply chain excellence, and identified leading companies as candidates for further study by the project

Definition of an Excellent Supply Chain

The group discussed many different approaches to defining excellent supply chains. Supply chain excellence can be defined by performance metrics like cost, inventory, and order cycle times. Responsive, lean, inexpensive supply chains are better than slow, costly ones. Supply chain excellence can also be defined by the thinness of the gap between demand and fulfillment. What prevents us from knowing demand? What does every customer want to buy? In a perfect supply chain demand would be known and satisfied. Combining the two notions might yield flexible, smooth efficiency in the network with the highest customer service.

Some people suggest that an excellent supply chain is one that wins at everyone's expense --- a zero-sum game in which suppliers are replaceable commodities. Others say an excellent supply

chain benefits all its members. Creating mutually optimized solutions requires trust and cultural norms which may not be universally held by all members or by companies in different countries.

Metrics of Supply Chain

Three categories of supply chain metrics emerged from the discussions: financial metrics (e.g., costs, working capital, Return-On-Investment, etc.), speed metrics (e.g., latency, inventory turns, and time-to-market), and customer-focused metrics (e.g., accuracy, quality, and customer satisfaction). Although most companies need some level of performance on all of these metrics, the strategy and context of a company's business imperatives drive the priorities among its metrics.

Company Examples

The SC2020 project will identify leading companies for further study. Current leaders provide insight into future prevailing practices. The IAC participants enumerated more than 30 companies who may be worthy of further study. In alphabetic order these companies were: AA (the Automobile Association in Britain), Amazon, Argos (catalog company), BT, C&S Wholesalers (food distributors), Cisco, Colgate, CVS, Dell, Domino's (pizza chain), Frito-Lay, GE Medical, Helix, IBM, Interbrew (brewer), J&J, Lucent, McDonald's, Nike, Nokia, nVidia (graphics chip maker), Owens & Minor (medical product distributor), P&G, Posco (Korean steel maker), Seagate (disk drive maker), Sears, Staples, Target, Tesco (UK grocer), Texas Instruments, Toyota, U.S. Department of Defense, Wal-Mart, and Zara (fashion retailer).

2. Definition of Excellent Supply Chains

The group considered what it meant for a supply chain to be excellent. This entailed thinking about several questions about excellence in supply chain design and management.

- * How do we know it when we see it?
- * Is it about the performance metrics?
- * Is it about how it supports a business strategy?
- * Is it about best practices it uses?
- * What companies are involved?
- * What makes these company supply chains excellent?

Leading companies tend to have both a distinctive operating model design and high-performance execution. The execution side of the definition implies a role for metrics.

3. Metrics of Supply Chains

Metrics objectify the priorities of an organization. Participants discussed three categories of metrics that might be used to help define excellent supply chains: financial, speed, and customer-focused.

3.1. Financial Metrics

In a competitive, profit-oriented environment, cost ranks high in the pantheon of supply chain performance metrics. Low total costs (cost of receivables, warehousing, inventory, assets, transportation, etc.) ensure high profit margins or cost-competitive products. Some companies assess working capital, such as a cash-to-cash cycle metric which reflects asymmetries in customer and supplier relationships in terms of who pays whom at what time for supplies versus finished products.

These raw dollar-figure numbers can be converted into ratios or percentages such as efficiency, Return-On-Investment (ROI), or supply chain spend as a percentage of revenue. Ratios and percentages help companies normalize performance measurement and benchmark across disparate industries. Cost metrics are important, but not to the exclusion of all else. Indeed, a company can rank well on costs metrics but still go out of business.

3.2. Speed Metrics

Measurement of speed starts with metrics for the latency or velocity of information -- the time it takes demand signals, for example, to propagate through the supply chain. Excellent supply chains see events sooner, and that enables faster response. Inventory turns are another common speed metric -- measuring the velocity of goods through inventory. Finally, order fulfillment speed helps measure the supply chain's competitiveness in time-sensitive service. Some models tie multiple metrics together. The 3-V model considers the Velocity of Visibility to manage Variability -- how long it takes for a change in demand to propagate through the organization.

Other speed metrics are tied to longer-term events such as the economic cycle, product lifecycle, or organization change efforts. Cyclic or unpredictable demand patterns lead some companies to measure how quickly they ramp production up and down. Time-to-market measures the speed with which companies can bring competitive innovations to the point of demand. Other speed-related metrics assess organizational innovation, such as the number of initiatives per year which the supply chain supports.

3.3. Customer-Focused Metrics

Many of the cost and speed metrics are internal performance measures. But what really counts is external demand fulfillment and customer satisfaction. Metrics such as accuracy, quality, and level of service quantify objective demand-side supply chain performance. Accuracy is an underplayed term -- speed gets more press, but order accuracy is just as important. Some companies also measure subjective customer satisfaction through surveys.

3.4. Balanced Metrics

In many ways, companies must achieve good performance on all of the preceding metrics, providing excellent timely products and services at the lowest possible cost. The balance of

financial, speed, and customer metrics depends on the company's strategy, industry, and phase of the economic cycle.

4. Strategic Focus

The perfect supply chain is more than best-in-class performance on a set of metrics. Excellent supply chains support the strategic imperatives of an organization, whether those objectives are low cost, high service, or differentiation. Strategic positions, such as customer intimacy versus operational excellence versus product superiority, may require using different metrics. For example, customer intimacy may require higher inventory, or it may mean more visits to the customer, which would be different than a cost-minimizing operational excellence model such as one that Wal-Mart may be pursuing. Strategy will determine the metrics that are appropriate for any given organization.

Excellence also depends on the industry. In retail, excellent supply chains figure out how to deal with aberrant slow movers. Prof. Yossi Sheffi noted the differences between pharmaceutical manufacturing and auto manufacturing. Although both have significant product liability issues, pharmaceuticals have high gross margins and 99.99% failure rates in R&D. But common principles -- such as the mathematical properties of forecasts, the impact of information on decisions, or the presence of risk and risk mitigation -- underlie all of these different businesses.

Prof. Charles Fine argued that each company actually has three different types of supply chains: a fulfillment supply chain, a development supply chain, and a capability supply chain. Whereas the fulfillment supply chain handles the routine production and delivery of products, the development supply chain handles the development of new products and resources. For example, BP considers its fulfillment supply chain, which moves crude oil to refineries to gas stations, to be easy compared to the development supply chain of finding and tapping oil reserves. The capability supply chain supports both the development and the fulfillment supply chains (such as by developing capabilities through training).

Regardless of the industry or type of supply chain, change in the overall business model can radically change the metrics used by the organization. If a company shifts from selling boxes or seats of software to selling entire hardware or software infrastructure solutions, then the metrics might change from part-oriented measures of production to holistic measures of customer satisfaction. Perhaps the best overarching metric would measure how well the supply chain supports the strategy.

In some ways, the ultimate excellent supply chain would be infinitely agile -- it would be able to mold itself to the changing environment and changing strategic directions of the company. One might say that the perfect supply chain would be like a photocopier. It would be ready and able to make perfect copies of any arbitrary product or service fed into it. This higher-order form of agility places more emphasis on the capability and development supply chains that play a role in remaking the fulfillment supply chain needed to "copy" the new product or service.

5. Company Examples

SC2020 will identify lead-edge practices that may become more widely used in the years ahead. To that end, the IAC is helping to identify current leaders in supply chain management, understanding how leaders do what they do and how those leading practices can be applied to other companies. In this first meeting, IAC participants suggested the names of more than 30 leading companies for future study under the four following categories:

- * Roles & Models: What trading partner roles and operating models will be deployed and governed?
- * Practices: What best processes enable efficacy, optimization, and risk-management?
- * Technologies: What technologies will be used to enable these processes?
- * Organization: How will companies and work be organized?

5.1. Roles & Models

* Supplier Collaboration

Several participants noted that Toyota excels at supply management. Toyota uses a deeply collaborative relationship that enables mutual understanding of the needs and the abilities of both Toyota and its suppliers. Toyota shares demand data and tracks supplier performance. In the event of problems, Toyota works with suppliers to correct the situation.

* Supply Sourcing and Management

Another participant mentioned that Seagate has done an amazing job in controlling supply chain costs under staggering rates of product deflation and product obsolescence. Through supplier management, Seagate has kept supply chain costs as a fraction of revenue constant, even as disk drive prices have plummeted from \$100 to \$3 each.

McDonald's was also mentioned as a company that creates global consistency with a distributed network of local suppliers. McDonald's has combined consistent low-cost, high-quality, and high-speed sourcing of perishable products. Other companies cited for their exemplary supplier management included Target and CVS.

* Mergers and Acquisitions

Some leading companies use mergers and acquisitions as a key element of their business model. Interbrew, the Belgian brewery, grows through acquisitions. Interbrew is able to quickly integrate new breweries which it acquires and makes those breweries efficient. Cisco, likewise, has used over 100 acquisitions in the past 5 years to buy successful new products, leveraging the R&D funded by independent venture capitalists. It integrates each of the new company's products into the Cisco supply chain to handle the upsurge in demand once the product is under the Cisco name.

* Service Models

Some participants suggested that supply chains might shift from a production-oriented model to a service-delivery model. Thus, leading financial service companies might provide insight into how supply chains could organize people in the future. Other service organizations, such as AA, the Automobile Association in the UK, might serve as interesting examples for service deployment and outsourcing. AA outsourced its fleet maintenance to its telecom provider and then leveraged the telecom company's dispatch system.

Other companies with high supply chain performance that were mentioned include Nokia, Frito-Lay, Tesco, P&G, and Colgate.

5.2. Practices

* Speed

Several of the IAC members emphasized speed as a critical principle for future supply chains. Companies from a wide range of industries -- from e-commerce companies to steel makers -- exemplify speed. Domino's 30-minute guarantee is a model for local point-of-presence and high-speed build-to-order delivery processes. Zara, a Spanish apparel retailer, uses speed to satisfy the fickle tastes of its fashion-conscious clients. And Posco, a steel maker in Korea, delivers steel to China in half the time of Chinese steel makers.

Internet-associated companies also made participants' lists of excellent companies. Dell, an old favorite, was mentioned as exemplifying speed and agility on multiple levels. Likewise, Amazon's speed is more than just fast delivery. On 9/11/2001, Amazon received more orders for the Koran than it had received in the entire history of the company. By quickly tapping into its partners' and distributors' inventories, the company achieved order fill rates in the high 90s. Finally, graphics chipmaker nVidia was cited for its fast ramp-up.

* Visibility

Visibility also rated highly on participants' minds. Amazon's real-time visibility, for example, enabled it to fill orders on 9/11. Nike has an amazing network operations center that lets it track shoe shipments anywhere in the world. Nike's visibility also fits in the Roles & Models category because the company outsources all of its manufacturing. In both the Amazon and Nike cases, visibility extends outside the organization. Visibility also applies before the sale -- IBM unlocked all the preliminary discussions that salespeople were having in order to make the supply chain more sensitive to future demand. Other companies with good visibility include CVS and GE Medical.

* Customer Intimacy

In an age of disintermediation, Owens & Minor is a medical and surgical products distributor that relies on customer intimacy. Close ties to doctors and the ability to deliver valuable product knowledge to them helps the company retain its market place in a changing world. IBM's conversion from a vertical, siloed organization has also helped it become more customer-responsive.

*** Demand Management**

Although many companies look to respond to demand, some leading companies look to control demand. For example, Dell uses daily changes in pricing and configurations to guide customers to PCs that Dell can quickly and inexpensively deliver. Zara seeks to not just follow fashion, but create fashion. As a side benefit of its high-turn retail strategy, Zara's customers purchase more when they are in the store because they know that Zara won't keep the clothes on the rack for long. Demand management helps an organization maximize profits by better connecting the supply side to the demand side.

*** Regulation Compliance**

A number of potential future scenarios involve increasing amounts of government regulation. Consumer protection, product testing, product standards, environmental standards, labor, and import/export laws all change how companies manage their supply chains and operations. BT was cited as a possible exemplar for operating under regulation.

5.3. Technologies

*** RFID**

RFID was a leading new technology on IAC members' minds. Wal-Mart's big push into RFID/EPC will drive adoption across the consumer goods industry. Declining costs for the readers and chips will then drive more widespread usage. RFID means more than chips on boxes. It enables much more intensive visibility.

5.4. Organization

*** Human Resources and Work**

C&S Wholesalers was cited for its excellent labor model design and use of incentives to create high profitability. Another company renowned for its people is Toyota. The film industry was also mentioned as an industry with interesting HR practices because it organizes work on a temporary project basis.

*** Internal Integration**

Three companies were mentioned for their efforts to reduce silos in the company: IBM, Staples, and Lucent. At IBM, for example, the role of the supply chain is now broad and expansive. Bob Moffat, head of IBM's supply chain, oversees the sales organization as well as new product development in addition to logistics. He and his people are the designers of IBM's ways of doing business. The organization executes what Bob and his people design. IBM has done a great job transforming from a vertical company to a customer-responsive company by integrating its silos.

Internal integration is hard, and the U.S. Department of Defense was suggested as a potential example of change management for integration. A Congressional mandate made the logistics divisions of the various armed forces cooperate and adopt integrated best practices.

6. Scenarios

Although the future, especially 15 years from now, is unknown, managers can prepare for the future by considering potential scenarios and understanding potential large-scale trends. Part of the Phase 2 effort will include developing likely scenarios and projecting the effects of such scenarios on supply chains of the future. These scenarios will be fed into a supply chain model to understand the impact of each possible future.

During the IAC meeting, participants discussed several scenarios, including:

- * **High Energy Costs:** Between declining oil reserves, geopolitical instabilities, and the rising use of energy in emerging nations, the price of oil is likely to continue to increase. If energy were ten times as high as today's costs, how would that affect supply chain design and management? High transportation costs might change the balance of off-shoring versus local production.
- * **Equilibrating Wages:** Sizable wage disparities between the Western countries and low-cost producer nations such as China and India drive the current paradigm of east-to-west supply chain flows. Yet the inexorable forces of economics suggest that wages will equilibrate -- rising standards of living in China and India will lead to higher wages in those countries. This may change the pattern of global sourcing and global demand for products.
- * **Over-Demand:** The recent economic slowdown and rising global competition created the current over-capacity (e.g., 60 million cars sold per year out of a 90 million/year industry capacity). Yet global economic growth and competition for scarce resources (e.g., oil, scrap steel) could lead to over-demand. How will supply chains change if customers compete instead of if suppliers compete?
- * **Regulation:** Government regulation could rise and come to dominate many business decisions. Companies would have to compete within the constraints of regulatory frameworks. For example, new environmental regulations on recycling end-of-life products could force companies to develop efficient reverse logistics chains.

7. Wrap Up

The meeting concluded with a discussion of plans for future meetings that call for four quarterly meetings per year -- 2 in person and 2 by teleconference. Different IAC members hope to host meetings at their corporate facilities, providing additional insight into how different leading companies manage their supply chains.

It was reiterated that research at MIT and industry knowledge from the IAC will combine to create a deeper understanding of supply chains. The SC2020 project will build practical knowledge about the longer range future of supply chains. This will help leading organizations retain their market lead even as the economic and technological landscape changes.