Proceedings of the Supply Chain 2020 Project's Industry Advisory Council Q1 2005 Meeting

Web Cast Held by the

MIT Center for Transportation & Logistics

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Background

The Supply Chain 2020 (SC2020) Project 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. Two advisory councils, the Industry Advisory Council (IAC) and the European Advisory Council (EAC), made up of supply chain executives from leading companies, are playing 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 (SCM) practices.

SC2020 research is broad and far-reaching, and is designed to meet a series of objectives in two phases. The objective of Phase I is to understand excellent supply chains and the underlying strategies, practices, and macro forces that drive them. Leveraging what is learned during the first phase, Phase II of the research will project the future using scenario generation and planning 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 work will also identify "sensors in the ground" -- approaches to recognizing which of the many possible futures is occurring. Forethought about the future will help companies position themselves for the long-term and avoid ill-conceived emotional responses to future changes in the world.

The fourth quarterly meeting of the IAC was held on March 17, 2005 via a 90-minute web cast to solicit insights from the corporate supply chain executives. The meeting was moderated by Prof Charlie Fine and Dr. Larry Lapide of MIT.

1. Executive Summary

Now three-quarters through its first year, the SC2020 Project hosted a webcast for its Industry Advisory Council on March 17, 2005. The webcast presented a project recap, a preview of the results of an analysis of how supply chain practices impact performance, and a continuation of the discussion of 2020 globalization scenarios.

Based on the analysis of 25 published studies, preliminary results show corroborated evidence of the impact of supply chain practices on company financial performance. Indeed, there are many links between supply chain practices and performance on operational and financial metrics. In particular, the research found strongly corroborated evidence for a link between supply chain integration and improved short-term financial performance and market share improvement. Supplier integration out-ranked the other types of integration in terms of its contribution to company performance. The research also uncovered strong links between a company's operational performance on customer service and responsiveness metrics and its ultimate performance on financial metrics. Surprisingly, supply chain cost was ranked third for evidence of a link to financial and market share results.

In this webcast meeting, IAC members continued their discussion of factors that will influence global supply chain footprints in the year 2020. First, one new cross-cutting issue was the problem of bottlenecks and vulnerabilities in logistics infrastructures: growing trade is straining ports, container ship capacity, and air freight capacity. Second, the Council also raised the issue of security for intellectual property as suppliers move to countries with less respect for patents and trademarks. Third, the continued discussion of RFID suggests that this technology has reached the bottom of the disillusionment phase and may see steady adoption, especially in Europe. Finally, the Council suggested that additional research on responsiveness might help companies deal with the paradox of lengthening supply chain distances in a world of faster clockspeed.

As part of Phase I of the project, a total of 17 graduate students and 7 faculty advisors from both MIT and Zaragoza have contributed to researching supply chain excellence in nine industries and 21 case studies. Other work is examining supply chain response to green laws, logistics parks, and retail assortment planning. A forthcoming IAC meeting at MIT, to be held on June 8, 2005, will present the research results from the first phase and help launch the next phase of the effort.

2. How Supply Chain Practices Affect Performance

Under the direction of Dr. Larry Lapide, a literature review by a post-doctoral researcher, Dr. Ting Shen, has helped to clarify the linkage between supply chain management and operational performance. This part of the SC2020 initiative involved performing a meta-analysis of published research on the topic. During the webcast, Dr. Larry Lapide previewed the results of the research, which will be more fully presented in a forthcoming SC2020-sponsored working paper.

2.1. Methodology

Dr. Shen analyzed and synthesized published research on supply chain practices for evidence of:

* Links between supply chain practices and financial performance
* Links between supply chain practices and operational performance
* Links between operational performance and financial performance

These three categories of links are interrelated. Studies of the links from supply chain practices to operational performance and studies of the links from operational performance to financial performance can be combined to further understand or corroborate studies that directly link from supply chain practices to financial performance. Dr. Lapide presented a short summary of the findings for the first and third of the three categories of links.

In total, the researcher found and analyzed the results of 25 studies, eight of which were conducted by commercial consulting or analyst firms and 17 by academic researchers. Most of the research was very new -- 84% of the studies dated from 2001 to 2004. The newness of the studies reflects the fact that supply chain practices have only recently been recognized as an important domain in business management theory.

Not all studies were considered equal for the purposes of the analysis. The quality and quantity of data affected the weight given to each piece of published research. For example, some of the studies used limited sample sizes of only a few dozen companies, whereas others pooled data from hundreds of firms. Thus, studies that used larger sample sizes received more weight. Similarly, some of the studies used less formal surveys or simple analyses, whereas others tapped into rigorous data and conducted sophisticated statistical analyses. Naturally, the studies using more rigorous data and sophisticated analyses received greater weight. This weighting scheme was used to help tally corroborated evidence for each type of link.

2.2. Supply Chain Practice Links to Financial Performance

Dr. Lapide presented a slide that tallied the number of studies that corroborated a link between various supply chain practices and categories of top-level business performance such as short-term financials, market share, and stock market performance. Supply chain integration was, by far, the most corroborated practice that impacted financial performance. In delving into this connection, the research found three types of integration that had corroborated impact on financial performance. The preliminary rankings were: 1) supplier integration, 2) customer integration, and 3) internal integration. A fourth type was mentioned, collaborative product development, but only one study found any evidence of a link.

Several studies found a connection between complexity management and financial performance. Complexity management included an array of practices, such as supplier rationalization and postponement -- practices related to either managing complex supply chains or reducing their complexity.

A variety of other practices had lower levels of corroboration, and while these practices may have a strong impact on performance, there are too few published findings from which to prove or disprove it.

2.3. Operational Performance Links to Financial Performance

Customer service performance and customer responsiveness showed the most corroborated links to short-term financial performance. Customer service -- the most corroborated -- included perfect order customer fulfillment and on-time delivery that were singled out as linked to financial performance in a number of studies. Customer responsiveness, the second most corroborated link to financial performance, included lead time, delivery speed, and time-to-market that were also singled out in some studies.

2.4. Key Surprise: Cost Isn't Most Important

The analysis of the studies of the link between operational performance and financial performance revealed one key surprise -- cost was not the most important issue. Although many companies emphasize cost reduction for its beneficial impact on the bottom line, the other, seemingly more important, operational factors contribute to the top line. Corroborated evidence shows that both customer service and responsiveness foster increased revenues, margins and profitability in a way that mere cost containment might not.

2.5. Understanding Links and the Priorities

The results of this analysis of 25 studies can help companies think about SC priorities. The fact that supply chain integration had the most corroborated evidence for a link to financial performance suggests that these types of practices bear further scrutiny. The fact that customer service and responsiveness had the most corroborated evidence for a link to financial performance suggests an emphasis on integration that impacts the demand-side of supply chain operations. The two observations are further corroborated by the prevalence of a direct link between customer integration and financial performance. The forthcoming working paper delves more deeply into this meta-analysis of the supply chain literature.

3. Globalization Scenarios Discussion

At the prior face-to-face IAC meeting, held at Dell in December 2004, the Council considered a series of globalization scenarios and cross-cutting issues. This will feed into the second phase of the SC2020 effort. During the webcast, Dr. Lapide and Prof. Charlie Fine reviewed the results from the earlier meeting and solicited suggestions for changes, further thoughts, or new issues.

3.1. Overview of Issues

The discussion of global scenarios centered around three core questions:

* What will the global supply chain footprint look like for manufacturing?
* Which resources might have excess supply versus demand?
* Will regulatory regimes be globally uniform or highly varied?

The Dell meeting surfaced a range of issues that might affect the global footprint of supply chains in the year 2020. These issues included:

* geographic competencies
* the ongoing pursuit of cheap labor
* the role of "patient capital" in attracting capital-intensive industries
* the unknown future of China and India with their rising middle class and growing numbers of engineers.

3.2. The China Question

China affects many of the global footprint issues with its high concentration of computer manufacturing, low labor rates, growing consumption of raw materials (e.g., oil and steel), the rise of the middle class, and high numbers of new engineering graduates. Several of the participants added their comments or refinements to the question on the impact of China.

Although many see China as just another, admittedly very large, pool of low cost labor, it may be more than that for several reasons. First, China offers new markets for global companies. For example, companies in Latin America already have access to local low-cost labor, but they see China as market opportunity for their products. Second, one member noted that many Chinese factories sport the latest technology. If so, this suggests that China can naturally shift from a low-wage nation to a high-productivity nation and remain price competitive long past 2020.

China does have a ways to go in some areas. First, China lacks a mature, Western-style judicial system. This leads to greater risks with contracts. Second, several members commented on the Chinese government's efforts to manage growth -- trying to ride a fine line between inflationary exuberance and stifling the rising future of the country. In some areas of China, growth has out-stripped the local infrastructure, forcing factories to only operate three or four days a week due to shortages of electricity. Yet China was lauded for its steps to improve the ingress and egress of foreign business activity and products. In some ways, the Chinese government was considered more proactive than the U.S. government in this regard.

3.3. Oil: Nightmare Scenario $100 or $200/Barrel?

One of the macro scenarios under consideration is the potential for significant increases in the cost of energy. The nightmare scenario presented at the previous meetings postulated that oil might reach $100 per barrel by the year 2020. But the recent meteoric rise in oil prices, driven by burgeoning demand in places such as China, suggests that $100 could be an underestimate. Already, oil has reached $56 per barrel. The notion of $200 per barrel oil, and all that that implies for raw materials processing and logistics costs, may be a more reasonable hypothetical scenario for the year 2020.

3.4. RFID

The prior meeting debated the impact of RFID -- would it be a disruptive technology? The general consensus at the time was that RFID was nothing more than “barcodes on steroids." If RFID does disrupt retailing, it may be ironic if Wal-Mart, through its RFID mandates, brings on its own demise as new competitors use RFID to out-compete the behemoth.

One arena in which RFID might be disruptive is in industries that currently don't use barcoding or other forms of IT-intensive monitoring systems. For example, RFID could provide a disruptive competitive advantage in the construction industry. During the webcast, some participants suggested other RFID applications that are less visible than retail. For example, companies such as Harley-Davidson and Brunswick are using the tags to control the flow of parts and work-in-process inside their factories. Companies such as Caterpillar, John Deere, and GE Power Systems are also using RFID in ways that may not make headlines but could create competitive advantage.

The adoption of RFID is uneven, based on companies’ proclivities to embrace the new technology or the mandates of powerful supply chain partners. Geographic variations in adoption are also appearing. One participant suggested that Europe might be ahead in RFID adoption for retail. This hypothesis was examined when the SC2020 European Advisory Council met at The Metro Group's RFID Innovation Center on March 22, 2005.

The participants continued the debate about RFID and its potential as a disruptive technology. Nay-sayers argued that the technology was not yet mature enough or cheap enough, especially for companies with well-developed optical barcode infrastructures. The costs of tags, readers, and integration with existing in-store or enterprise systems create a high hurdle. Others countered that they are aware of recent RFID implementation efforts at Marks & Spencer, which feature quite reasonable technology costs. The lower the cost of a reader, the more readers that companies can deploy. The greater the number of readers, the more companies can use the technology in new ways, such as monitoring shelf availability for rapid replenishment.

Looking into the future, some suggested that RFID is only going through natural growing pains -- the hype has peaked, disillusionment has set in, and the technology is slowly moving toward adoption where it makes sense. Barcodes took more than a decade to reach widespread use; RFID may take another 3-5 years for the costs to come down. RFID does face one major hurdle before it could become disruptive: the hurdle of process change. If RFID is to become anything more than a non-line-of-sight barcode, companies must design new processes that leverage RFID infrastructures in new ways.

4. Additional Cross-Cutting Issues

A number of issues cut across multiple industries. These include issues such as logistics parks, green laws, security issues (of both physical and information assets), outsourcing decisions, and accelerating clockspeed. Council members reviewed a list of cross-cutting issues previously identified and uncovered additional ones.

4.1. Infrastructure: Capacity, Growth, and Vulnerability

The Council brought up and discussed the serious issue of bottlenecks in logistics infrastructures around the world. A dramatic rise in maritime shipping has created shortages of ships, containers, and port capacity. For example, companies that order a new container ship have to wait four years before receiving one, due to heavy demand. A shortage of shipping containers has led to onerous land-use charges for taking containers away from the port. (For example, some West Coast ports in the US are charging $2000 per container that gets put on rail, because they want to keep the containers on the West Coast.) Finally, in terms of port capacity, the Chinese government has ambitious plans for port expansion, but these plans involve very long -- seven year -- construction projects to create port facilities, build dry docks, and to dredge channels.

The bottleneck issue involves more than just fast-growing shipping volumes at Chinese ports. U.S. ports also suffer from serious bottlenecks, as evidenced by the handling delays that occurred in the autumn of 2004. The U.S. ports are currently bogged down by antiquated work-rules, poor productivity, and a shortage of available land. U.S. workers take three times as long to unload a ship as their Japanese counterparts. Some automation is slowly being deployed in ports, but crane operations appear to remain a bottleneck. Another improvement is that the port of Long Beach is expanding -- they are quickly converting adjacent naval facilities to add about 30% more capacity.

Air freight is also seeing some capacity issues, but to a lesser degree. Fortunately, the Chinese government appears to be moving toward an open-skies policy, and air-freight companies are adding more flights to the area. Nonetheless, securing landing slots at key Asian airports, such as Tokyo and Korea, involves a ponderous mass of red tape. The slow pace of these bureaucracies is at odds with the need for flexible, time-definite additions of surge capacity.

Related to this issue is a growing concentrated footprint of suppliers in Asia and the resulting new vulnerabilities. If a major port or airport in the region experiences a disaster, then large numbers of companies may find themselves in serious trouble. In the past, if a company had problems getting supplies from Italy, it might second-source from Scotland or Denmark. Now, many companies have no second sources in other regions.

4.2. Intellectual Property Security: Protecting the Crown Jewels

One dark side to operating in China and some other countries is the low level of respect for and protection of intellectual property. Telecom companies are especially worried about theft of technology and counterfeit goods because so much high-tech manufacturing has moved to China. One participant suggested that China needs to "get honest" with regard to enforcement of patent and trademark law. This is one of the areas in which RFID may help, at least in the area of counterfeit products. The tags are being considered for use on pharmaceuticals to help forestall the rising threat of counterfeit drugs. Such tags could also be used to ensure the authenticity of branded goods. The preservation of intellectual property could be considered another type of asset that has security issues.

5. Wrap-up

5.1. Additional Topics for Research

When asked about the need for additional research, one member raised the issue of responsiveness. In situations where the global footprint of supply does not match that of demand, issues of long leadtimes interfere with the trend toward faster clockspeeds. Research could help understand how companies cope with the paradox of increasing distances and decreasing time in their go-to-market strategies.

5.2. Next Steps

The next IAC quarterly meeting for the project will take place at MIT on June 8, 2005. This meeting will feature presentations on the SC2020 work performed during the first phase of the project. The meeting will continue the discussion of the global footprint and cross-industry scenarios, to help launch the project into its second phase.