Proceedings of the Supply Chain 2020 Project's European Advisory Council Spring 2006 Meeting

MIT Supply Chain 2020

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Supply Chain 2020 Project 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 process innovations that will 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 farther into the future than most business research initiatives, the SC2020 project hopes to deliver practical advances 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 several phases. The objective of Phase I was to understand excellent supply chains and the underlying strategies, practices, and macro forces that drive them. Leveraging what was learned during the first phase, Phase II and later phases of the research are identifying underlying principles and projecting 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 success. The work will also identify "sensors in the ground" -- approaches to recognizing which of the many possible futures are 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 Spring 2006 semi-annual meeting of the EAC was held on 7 April at The Zaragoza Logistics Center (ZLC) to solicit insights from the corporate supply chain executives. The meeting was held the morning after a symposium titled "SC2020: Building the Future Supply Chain Now," which was attended by invited guests of the ZLC as well as EAC members. The meeting had the following major agenda items:

1. Re-cap of Yesterday's "SC2020: Building the Future Supply Chain Now" Symposium (Dr. Larry Lapide, MIT-CTL)

2. Input on the SC2020 Working Scenarios and Approach (Dr. Mahender Singh, MIT-CTL)

3. Supply Chain Taxonomies (Dr. Edgar Blanco, MIT-CTL)

Recap of the SC2020 Symposium

Dr. Larry Lapide started by providing a summary of the SC2020 project. Overall, the project seeks to understand what excellent supply chains might look like in the year 2020.

The European Industry Advisory Council (EAC), in conjunction with its American counterpart, serves two purposes within the project. First, Council members provide information about current supply chain practices. Many of the Phase I case studies were of Council member companies or were recommended by the Council. Second, the Council helps ground the research effort to ensure that SC2020 examines realistic futures, not supply chain "science fiction." Due to logistical difficulties with meetings in Asia, the project relies on the global companies in its American and European Councils to provide Asia-related supply chain insights.

Phase I of the SC2020 project researched current-day excellent supply chains, creating 16 theses with 21 case studies covering nine industries. This work emphasized extracting the underlying success factors, performance objectives, models, practices, and principles that occur across companies and industries. By uncovering the principles or "laws of physics" for supply chains, rather than the just the practice innovations *du jour*, the project can develop a better understanding of the strategies employed by future supply chains under different scenarios.

Phase II is dividing efforts between three tasks. First, the project will spend 40% of its time developing macro-factor scenarios. Second, the project will develop supply chain models (20%). Third, the project will complete the work begun in Phase I on supply chain principles (40%).

The third and final phase of SC2020 will finalize the supply chain modeling work begun in Phase II. The final task of the project is to intersect the future scenarios with the supply chain models to understand how different types of companies and industries might respond to different futures. Analyzing this result will lead to recommendations for medium-term (3-5 years) actions and recommended "sensors in the ground" that enable companies to detect relevant shifts in their supply chain environments.

Discussion on Disruptive Demographics

Council members discussed their companies' experiences with disruptive demographics -- how an aging population is one of the major macro-factors for the future. The presentation during the symposium described how increasing lifespans and decreasing birthrates mean a radical increase in the percentages of elderly people in many developed countries. This readily-foreseeable shift may impact business in two areas. First, it implies new opportunities for products and services that target the aging population. Increasing home delivery or senior-friendly pick-and-pack services would change many companies' logistics. Second, a growing number of older workers may lead to labor shortages in blue-collar logistics work and force companies to find innovative solutions to accommodate the declining abilities of older workers.

Some members note an increasing use of automation in logistics, especially warehousing. Automation also means the need for fewer workers and the ability to pay each highly-productive worker a high wage. Other companies plan to shift activities from countries with aging, high-cost labor pools to those with younger, low-cost workforces.

The ongoing shortage of truck drivers will worsen with an aging population. Already, companies are losing older drivers who fail their vision tests. For this and cost reasons, some companies recruit Eastern European drivers or trucking companies to handle long-haul routes in Europe -- a Czech truck driver costs one-third as much as a German one. Yet this does not address driver shortages for local short-haul routes, such as restocking of retail locations. Companies can't outsource distribution to other countries. Council members also expressed concerns over the safety issue caused by a potential flood of poorly-trained drivers who do not understand local languages and traffic laws.

Pay is one underlying factor in worker shortages. Despite high unemployment in Europe, companies say they cannot fill blue-collar supply chain jobs. Yet this may only be a matter of money, according to one Council member. For example, unionized high-paying positions such as garbage collectors have fewer problems with recruitment. The Council also noted the American practice of redesigning truck routes to get drivers home each night, thereby giving them a better work/life balance.

Immigration is another common response to an aging population. European companies are importing young workers from Eastern Europe and the Middle East. For example, one member noted a 40% Polish population in a Dutch warehouse. Even the signs in the building were in Polish. The prevalence of immigration varies by country, with the UK and Spain being more open to immigration than other countries in the EU. On the one hand, the developing nations represent a deep pool of perhaps 10 to 20 years of cheap labor. On the other hand, as these developing countries raise their standards of living, then their workers may be less apt to emigrate, and companies will find they have no more low-cost labor regions in the world.

Discussion on the Outlook for Energy

Dr. Lapide commented on the contrast between American and European council members' attitudes about high oil prices. At the U.S. SC2020 meeting, many members were quite angry about high oil prices. The Europeans were less bothered, although they did blame US and UK government leaders for exacerbating fears in the global oil markets. European Council members suggested two key factors for the contrasting reactions to oil price increases.

First, Europeans are far more accustomed to high oil prices because their governments levy very high taxes on fuels. When American gas prices rise from $2 a gallon to $3 a gallon, a 50% upsurge, Americans complain. When European gas goes from $5 a gallon to $6 a gallon -- a 20% price-bump -- Europeans barely notice. Europeans also have more fuel-efficient diesel cars, so increasing fuel prices impact them less.

Second, some Europeans expressed private satisfaction with higher prices for the potential long-term environmental benefits. High fuel prices will drive green practices. Europe is already ahead of the U.S. in the adoption of renewable energy sources. Europe sees high oil prices as a means of weaning the world from environmentally-damaging fossil fuels.

The broader issue was the role of governments and private individuals in energy use patterns. Although gas is a global commodity, when gas was $2 a gallon in the U.S., it was $4 in Europe, $4 in India, but only $1 in China due to differences in taxes and subsidies. These policy differences affect demand. Council members noted the role of private cars in increasing oil demand; some feared the potential for Asians to adopt Western energy-intensive lifestyles. Single-occupant cars represent a waste that could be reduced through new Internet-based carpooling initiatives.

Dr. Blanco asked how European companies might change their supply chain networks with increasing fuel prices. Some Council companies were reexamining the various tradeoffs between inventory, service level, and cost of transportation. Council members suggested that companies can improve effective fuel efficiency and ameliorate the impact of high fuel costs with better asset utilization. Many companies know that they have low asset utilization on trucks, which implies that much fuel is burned on empty miles. Companies are looking into consolidating shipments, coordinating backhauls, and using contract logistics. Some companies, such as petrochemicals companies, might use asset swaps or product swaps that let distribution outlets receive goods from the closest production facility even if that facility is owned by a competitor.

The larger issue is that fuel is only one factor among many cost tradeoffs. The labor cost differences between France and Poland, for example, can still justify moving product back and forth across the continent. Similarly, other companies have selected minimal inventory models that lead to higher transportation costs in exchange for JIT benefits. Increasing fuel costs are motivating some companies to balance fuel-sensitive transportation costs against these other factors.

Input on the SC2020 Working Scenarios and Approach

Dr. Mahender Singh contrasted scenario planning with forecasting. In general, forecasting techniques attempt to extrapolate the quantitative values of key variables such as product demand or oil prices in the future. To incorporate the effects of uncertainty, often a plus/minus range around the forecasted number is used, but the world does not work that way -- the future is more than just a numerical adjustment to the present. In contrast to forecasting, scenario planning acknowledges that the inherent uncertainties in the future. For example, depending on time frame under consideration, the balance of power may shift between governments, communities, and markets to radically change the landscape of regulation, consumer preferences, and competition and thereby the underlying structure of the problem.

Dr. Singh solicited feedback on the scenario exercise conducted during yesterday's symposium. Some of the Council felt that the scenario introduction process was too abbreviated -- that they dove into the scenarios too quickly. It takes effort to step out of today and into a distant hypothetical tomorrow, according to one Council member. The Council recommended crafting richer scenario stories to help participants shift into a scenario's world.

Council members also varied in the timeframe of their outlooks. Some members operate supply chains that are very reactive and tactically focused, such as those related to retailing. They know their customer's KPIs and emphasize on speed and flexibility to reorganize their supply chain to suit the needs in the short term. For them, a 3-to-5 year time period is as far as into the future as they want to look, and a 15-year horizon isn't part of their business planning process. The time frame of 15 years, however, makes sense for other members who make multi-billion dollar investment decisions and use assets for 10 to 30 years.

A key issue was the role of brick-and-mortar assets in the supply chain. It was argued that even if a company outsources asset-intensive logistics activities (e.g., warehouses) or only signs limited-length leases, the company isn't immune to the costs and risks of such assets. Someone must invest in these assets, and if those assets are risky or costly in some future scenario, then it will show up in the cost of the services or leases. For example, if home delivery becomes 50% of retail, then many companies might experience an expensive, radical remaking of their supply chains.

Some Council members worried that all these hypothetical scenarios would dilute management attention. Suggestions were made to associate probabilities to the scenarios to focus efforts on the more likely scenarios instead. They wanted a more pragmatic view, whereas most scenario planning methods advocate not estimating the probability of the scenario. The argument against trying to find the most probable scenario is that it pushes the discussion away from thinking about the myriad diverse outcomes that are plausible and how a company could prepare for the unexpected. In addition, an integral part of the scenario planning process is the idea of "sensors in the ground" – modulating executive thoughts to be aware of critical shifts in the world – rather than creating laborious plans based on a given forecasted future. Dr. Singh suggested that if people look more closely at the SC2020 working scenarios, they will see that all the scenarios are plausible.

As an example, Dr. Singh described UPS' successful use of scenarios. One of the robust implications from the package carrier's 1997 scenario generation effort was a recognition that UPS lacked a branded consumer-side outlet. This awareness primed the company to buy the Mail Boxes Etc. (MBE) network of over 4,000 outlets in 2001 for $191 million. UPS' move forced FedEx to pay -- some say overpay -- some $2.4 billion to purchase Kinko's smaller 1,200-outlet network. The point was that scenario planning made UPS aware of possible shifts and opportunities that they could act on when the time was right.

One of the challenges of the SC2020 effort is that of accelerating the scenario generation process in the heterogeneous SC2020 Council. Typically, when an individual company embarks on scenario planning journey, they spend a lot of time in multiple meetings and sub-teams over a six

to nine months period to both generate the scenarios and generate buy-in for the process. Obviously, the infrequent and short meetings of the SC2020 group along with the general nature of the question and environment haven't fostered enough buy-in yet.

Dr. Singh hoped that SC2020 could reduce the scenario planning time for member companies by creating a set of pre-researched, supply chain-relevant scenarios that companies could then adapt to their respective needs. SC2020 is using a hybrid approach to merge both top-down and bottom-up insights about relevant scenarios for supply chains. The SC2020 project can do the research needed so that companies don't need to reinvent the wheel. Companies would then take the SC2020 work, filter it for their own context, and then work with the scenarios inside their organizations to create understanding and buy-in.

Supply Chain Taxonomies

Dr. Edgar Blanco discussed how the SC2020 project will use taxonomies to help generalize its results and reduce the complexities of presenting likely supply chain strategies under different scenarios. Taxonomies serve three functions. First, they let us analyze and contrast different supply chain strategies. Second, they let us analyze and contrast supply chain practices. Third, they provide a means of presenting supply chain strategies under each future scenario.

Potential Descriptors for Supply Chains

Dr. Blanco solicited information from the Council as fodder for his work, because the project's exploration of taxonomies is still in its early stages. He asked the members of the Council to quickly list alternative descriptors for their own companies -- each representative enumerated about half-a-dozen key characteristics of their respective supply chains. The goal of the exercise was to uncover salient commonalities and differences for how modern-day companies describe supply chains. These commonalities and differences can then be organized to create a taxonomy.

Many members highlighted key performance indictors that drive their supply chain management. These KPIs included cost factors (TCO, transport cost, etc.), inventory, service levels, and asset utilization. Others mentioned quantitative variables that distinguish them from other companies, such as high-value product, large SKU counts, BOM complexity (component counts), high capital investments (relative to revenues), shelf-life, or time-to-market variables.

Internal or external organizational factors appeared in some Council members' descriptor lists. Internal organization descriptors alluded to the presence of silos, front-office/back-office separation, and centralization/decentralization alternatives.   Other clusters of descriptors focused on a company's relationships with either suppliers or customers.   These included descriptors for outsourcing versus insourcing or a reliance on particular outsourced functions, such as 3PLs. Other descriptors delineated levels of collaboration (e.g., data, but not process-level collaboration). These relationships can be asymmetric, in that a company collaborates on

the supplier side, but not the customer side, for example. Finally, one Council member mentioned descriptors related to government regulations and taxation.

Still other groups of descriptors alluded to key challenges that can bedevil a supply chain. For example, a company may have limited control at the supply chain's end-point or point-of-delivery -- the last few yards of fulfillment. Another company had a cost focus but knew that it needs to shift to a value-focus. Still another alluded to a challenging gap in key timescales -- it has very short order fulfillment requirements on the demand side, but very long lead-times on the supply side.

Because so many of the Council members are very large multinational corporations, many alluded to having different descriptors for different parts of their supply chains. These might include differences across product lines, e.g., multi-temperature or multi-speed supply chains. Other differences involved multiple channels or geographic regions with different supply chain properties. In some cases, Council members provided descriptors for only a subset of their business or provided a more general framework for how their company managed its diversified businesses.

Taxonomies from the Supply Chain Literature

The supply chain literature also provides a source of ready-made taxonomies, which Dr. Blanco summarized. Some previously-developed taxonomies use industrial or product descriptors to distinguish between categories such as innovation-driven high-tech, commodity natural resources, and heavily-regulated products (e.g., pharmaceuticals). One taxonomy from the literature emphasizes different strategies for the decision of what to make and when to make it, such as build-to-stock or engineer-to-order. Some Council member companies echoed this taxonomy when describing their supply chains. This taxonomy focuses on the push/pull boundary in the supply chain and considers tradeoff issues of lead-time versus inventory.

Another taxonomy, hotly debated by the Council, contrasts so-called functional vs. innovative products, which lead, respectively, to efficient versus responsive supply chain strategies. At issue were the various dimensions of innovation in supply chains. For example, a company in an innovation-seeking market might use its supply chain to push innovative products, whereas a company in a commoditized industry might use supply chain innovation to deliver commodity products efficiently.

Dr. Blanco's goal is to select a useful taxonomy for the purposes of SC2020. This implies finding a taxonomy that provides valid distinctions for the recommended future strategies for the different scenarios. One analog of this is Lee's approach of matching supply chain strategy in the context of the combination of a taxonomy of the demand side (functional-product markets vs. innovation-driven markets) and a taxonomy of the supply side (stable supplies vs. evolving supplies). The four combinations of largely exogenous factors drive companies toward four stable strategies.

The point is that a taxonomy of supply chains provides a framework for discussing the salient impacts of future trends in macro factors or scenarios. Ongoing work will identify those taxonomies that best suit the needs of the SC2020 project.

The meeting adjourned.