white paper

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Next Generation Supply Chain Strategic Planning Technology and Applications

What is supply chain strategic planning? It's not execution, and it's not re-engineering. It is strategic decision-making and business-planning by forward-thinking companies. Operational supply chain strategy remains the weak link in the market, mainly due to the degree of difficulty involved in using sophisticated models and complicated algorithms. In the future, we will see the application and integration of powerful new models to produce a whole new class of supply chain strategic planning suites. All the while, supply chain planning will grow and merge with the IT-based, demand planning-focused solutions.

Introduction

Nearly two years after the publication of my series, "The Manager's Guide to Supply Chain Planning Tools and Techniques," things are as confusing as ever. If my stated goal was to help people understand how the different supply chain planning tools and techniques fit together, to contribute in some small measure to the overall level and quality of supply chain knowledge and competency, then I failed miserably. It remains a challenge for even the supply chain planning gurus themselves to sort through all the breathtakingly ambiguous pronouncements about "we can optimize your supply chain" and "your passport to world class supply chains" that are trumpeted without embarrassment across hundreds of Web sites and thousands of sales brochures.

Since neurotic obsession is an integral cycling phase of every aspiring software developer's psychological Carnot cycle, I must refuse to give up. This white paper will attempt to make some small progress in seeing both the "forest for the trees" and the real business issues for the software tools. What's more, we must identify what part of the forest we are going to be operating in, as it's a wide world of simulated firs and optimized evergreens out there. Our approach, therefore, must be to identify the parts of the forest in which we will *not* be camping, before setting out on our orientation hike in our own neck of the woods.

Our neck of the woods happens to be supply chain strategic planning. It is not "execution" or planning in general, and definitely not "supply chain reengineering," but instead, decision-making and business-planning problems considered strategic by the companies that deal with them.

Objectives and Agenda

We will begin by exploring the current state of supply chain planning and improvement thinking. What are the "strategic" supply chain planning questions? What are the main approaches used by consultants to answer these questions? How are process-based and operational-based approaches different?

Next we will discuss a methodology for integrating the use of the most advanced problem solving tools for our neck of the woods: strategic decision making. Supply chain strategic planning questions often require multiple techniques to get at the best answer. We will dive into some good detail about how these tools work, what they do, and what they don't do.

Finally, we will highlight examples from several companies, to show you how the thought leaders in this area are putting these technologies into practice. We have a lot of ground to cover, but it will be worth the journey!

Here's a disclosure note: You need to know that the company I work for, LLama-Soft, is one of the vendors with tools cited in this article.

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Hopefully, it will become apparent that this report has not been written as a sales-oriented or promotional article, but rather as an educational piece that attempts to clarify and elucidate, rather than to color and obfuscate. Obviously, we believe we provide an important missing piece in the supply chain strategic planning market. However we are kept honest by the fact that LLama-Soft is not the only answer, and indeed, can't provide the answer to every single problem in this extremely important and diverse area.

What are Supply Chain Strategic Planning Problems?

Every company that manufactures, distributes, transports, or stores inventory to sell to customers has to make many, many decisions about how its operations will run. An office products company, assuming that it is already currently in business, must decide each day what will be produced on Line 2, Plant 1. It must decide how much of each product, and in what sequence. Another company is grappling every day with how many widgets to pull out of inventory and put on the truck to Cleveland. Companies make millions of these decisions every day. They are important, but they assume that very little in the overall situation can change. This makes them "operational" decisions.

Other, higher-level decisions, don't make the same kind of assumptions. If you free up the decisions, if you let the inventory target for SKU AG001011 target

change, or if you can select to ship from one of several warehouses by different modes of shipment, then you are dealing with tactical decisions. Tactical decisions assume that core structural components of the network, such as products and sites, are fixed, but how the components interact, and the rules for interaction that the sites follow, are allowed to change.

Finally, for strategic planning decisions, anything can change – except, of course, the external demand market. The goal of strategic planning is to arrive at the most efficient, highly profitable supply chain system that serves customers in a market.

Of the three types of decisions (all of which overlap with the other two), supply chain strategic decisions involve the largest capital expenditures, the biggest risks, and, if made poorly, the most dire results. Strategic supply chain decisions often pose such significant questions as:

- How many plants and warehouses should I own?
- Should I close any of them?
- Should I stock inventory? For which products? In which locations?
- Should I outsource the task of transporting goods throughout my network?
- Should I make the key subassemblies, or purchase them? From where?

As you can see, from strategic decisions all else flows. Can you truly optimize the production schedule at the Detroit plant if you don't even know whether you should manufacture products in the U.S.? Can you seek optimal safety stock levels while deciding whether inventory should exist?

It's a little – no, it's a lot – like making sure your boat crew is moving your craft as fast as possible, without bothering to check which direction you are pointed in.

Two Paradigms to Supply Chain Strategy

Technology vendors are making the situation worse. Promises to optimize and improve your supply chain without analyzing and understanding the supply chain's complexities and dynamics at best rely on

chance, and at worst border perilously on fraud.

I dare you to do a Web search on supply chain optimization. You will find IBM promising "Supply Chain Optimization" by Web-enabling your enterprise, a book from CSC Consulting on supply chain optimization, and i2 and Manugistics offering "solutions" that optimize your supply chain. Are these guys speaking the same language?

Actually, they're not! All of these companies, and the many others you will find, all do something different. Most of them do what they do extremely well. Most of them truly can help improve various aspects of supply chain performance. None of them do everything, and if they tell you they do and you believe them, call me immediately – I've got some beautiful beachfront Utah property to sell you.

To understand where all of these companies are coming from, you must understand where they have been. Over the last few years, supply chain vendors and supply chain ideas have evolved into two camps, or tribes: the IT Tribe and the Logistics Tribe.

The IT Tribe

The larger tribe is the IT Tribe. Members of this tribe believe that information is the key to supply chain improvement. They focus on collaborative planning, sharing information, and getting companies synchronized with their suppliers and their customers. They also focus on getting internal departments and divisions synchronized so that they can be centrally controlled and coordinated. This tribe is incredibly good at marketing.

The Logistics Tribe

The smaller, more ancient tribe, is the Logistics Tribe. The Logistics Tribe focuses on applying high-powered numerical analysis to large data sets to solve huge planning problems through analysis and optimization. The Logistics Tribe has been around for several decades, and knows a lot about things like industrial engineering, logistics, and operations research. This tribe is incredibly bad at marketing.

Perhaps surprisingly, both tribes are right in their core theses. Both tribes have a lot to offer the modern enterprise. I find it useful to differentiate between the two tribes by how they orient their focus on the enterprise: the IT Tribe has an external focus, keying in on interactions with other enterprises, while the Logistics Tribe has an internal focus, and hones in on operations within the enterprise itself.

You can also differentiate the two Tribes by skin color, if you wish. The typical Logistics Tribe member looks a little pale and is comfortable with 1950s fluorescent industrial lighting technology. He or she rarely leaves the building. The typical IT Tribe member just got back from vacationing on St. Thomas before leaving for training in Germany or the Netherlands.

The point here, and there is one, is that the two tribes of supply chain improvement are both essential and complementary. A company that is looking for improvement dollars by coordinating their production schedules with their customers will likely find dollars. The company that is seeking to trim yen outlays by increasing manufacturing flexibility and optimizing their distribution network cost structure will probably be able to do so. The most powerful approach, and the approach that will be the standard in the future, is to leverage the external and the internal focused efforts, to make the two tribes work together.

Strategic Decision-Making: Qualitative vs. Quantitative Orientations

Now that we understand the lay of the land, and the strange native peoples that inhabit that land, let's start to focus back in on the strategic planning issues.

We have already talked about supply chain strategic planning problems, and pointed out that they were the most important, biggest dollar (and hence highest risk) problems facing companies. We also discussed the two tribes' approaches to solving them. An important implication, which I want to state explicitly, is that strategic planning problems are also the most difficult to

analyze and solve rationally.

It is often the case that high-level discussions of supply chain strategy are completely devoid of facts. High-level decisions about how to organize company operations and logistics end up being a forum for political gaming and salesmanship, with outcomes decided by personal charisma and volume, rather than rationality and science.

It's no wonder that supply chain strategy often boils down to who has the biggest gun. Supply chain strategic problems have been nearly impossible to model and analyze rationally. The problems involve huge data sets, with complex data interrelationships and a great deal of uncertainty. There is no single computational approach simply to "solve" a strategic planning problem, which leaves a void. Non-quantitative or "soft" arguments can win on the gray battlefield of murky logic and guesswork.

Imagine that instead of discussing how to improve global supply chain strategy, company executives were discussing, say, global weather patterns. The engineering-minded folks would bring up their computer models, talk about butterflies over the Sea of Japan, and the need to model individual air molecules. The non-technical folks would argue that the weather has "always worked this way" and that "I've been in the weather business for 20 years, and I know how the weather operates." Let's face it, when fact vacates the discussion, everyone left arguing sounds like a yapping poodle or a silly clown.

The Next Generation: Operational Strategy

This problem is common to many companies across many industries. The need is present for tools and technologies that can help move the discussion into a fact-based approach. The tools and techniques that perform this function are, in fact, the next generation of supply chain software applications. These tools will leverage the data provided by IT, but will use powerful engineering and operations research algorithms to move supply chain strategic planning decisions into an orientation I

call Operational Supply Chain Strategy.

Increasingly, the IT Tribe will pose supply chain strategy questions that must be answered using Operational Strategy approaches. Take the case of a global merger between two large companies. The wizards in the CFO's office determine that the merger is good business and makes sense financially. IT is brought in to "integrate the supply chains."

Historically, the result would be a fixation on linking ERP systems, a project that aligns and combines corporate databases with little or no thought to how the actual supply chain operations of the new combined company can be improved. Simply linking IT systems will not provide the cost-cutting measures or efficiency improvements that the CFO is looking for. The architects of the merger must analyze and arrive at an operational strategy for the new company, based on the physical reality of the business.

There are many reasons why Operational Strategy and real operational improvement are not part of the typical IT reengineering effort or ERP implementation today. One is the issue of tribal affiliation raised earlier. Another is the fact that these IT-based projects are so complex and sweeping, an attitude gets promoted that "we should just get the system in place, then figure what to do with it." While this attitude is understandable, the problem is that it is the operational changes that will provide the ROI promised by the IT project in the first place! This is why many companies implement ERP or supply chain planning software packages looking for an ROI that doesn't materialize. Automating a process doesn't improve it, but just makes it automated.

Real improvement comes from making a change to the way business gets done, both from a process standpoint and from an operational standpoint.

Introduction to Operational Strategy

The operational strategy to supply chain strategic planning can, from a macro-level, be thought as a four-step process. Remember that in strategic planning

almost anything goes; therefore, we have to start from the few things that can't be changed, the most important thing being, of course, customer demand.

From customer demand, we need to go through four different steps or phases to analyze and make the big decisions. The four phases are network optimization, network simulation, policy optimization, and design for robustness.

Network Optimization

From customer demands, we need to decide on the basic structure of the network. Which sites will be included (out of the hundred of candidate site locations) and who will supply whom? What is the fundamental network configuration that will best minimize the total cost of servicing the demands (which we can't really control, but which we can better manage through our external collaboration improvement efforts)? The task of structural design means being able to evaluate millions and millions of potential structures, and selecting the single least cost network.

This is exactly what "network optimization models" do very well. Utilizing huge math models and highly advanced solution-finding technologies, network optimization tools have been widely used for strategic planning. The leading vendors are companies such as INSIGHT, Intertrans (now part of i2), and CAPS Logistics (now part of Baan).

Network Simulation

The problem with network optimization is that in order to evaluate millions of models the models are greatly simplified to basically cost-focused math models. When it comes to finalizing the proposed design, or selecting which network design is best out of the three or four alternative designs, we need to better predict how each design will really operate in the real world. For this we use "network simulation." Network simulation uses a very detailed and complicated model which will tell you how well a proposed supply chain will run, but will not tell you how to change it to make it better.

There are many vendors who provide "general discrete event simulation" modeling tools that can be used to build these complicated models. Additionally, a new class of "supply chain simulator" tools is emerging. These supply chain simulators are specific to supply chain problems and are usually based on an existing modeling platform. LLama-Soft, Inc., with through its tool "Supply Chain Guru," provides, at this time, the only fully "off-the-shelf" application of this kind, but there are several others tools likely to be released and marketed in the next few years.

Policy Optimization

Once a network design is finalized, and the sites and products are set in place, the task is to come up with the best "operating rules" or policies for the supply chain structural objects to follow. Policies include rules about whether inventory should be kept for various products, whether full truckload shipments suffice, or whether LTL shipments are needed to achieve the necessary customer service; should we make or should we buy for each of our products and main sub-assemblies?

Policy optimization is a very difficult task, and there are currently no tools that are both detailed enough to predict network performance and intelligent enough to prescribe what policies to use. There are really two main technologies available that come close. First, there are network optimization models that apply multi-time period analysis or more detailed production planning constraints. Second, and more promising, are those tools that apply optimization or goal-seeking methods to simulation models, to attempt to prescribe how the simulation model can best be improved. Eventually, even higher level intelligent design tools will apply combinations of simulation and optimization models in tandem to truly design how networks should be designed and how they should operate.

Design for Robustness

The fourth phase of supply chain strategic planning is the geekily named "Design for Robustness." Basically, for the first three phases of operational strategic planning, we have focused our efforts on designing the best supply chain based on what we expected to happen. In design for robustness, we attempt to evaluate if there are things that might happen, to ensure that our network doesn't perform poorly under "other than expected" conditions.

This is a difficult concept for most people to grasp. Think of it this way: the goal of supply chain management is not just to be profitable – there is an implicit goal to avoid extremely bad performance even under conditions that are unlikely but possible. Optimal supply chain designs, arrived at through the first three phases, often tell us to close warehouses, or move plants, or to make other "big ticket item" changes. What if we were wrong about demand? What if the cost of supply doubles? What seemed like a good idea given our forecasted conditions may kill us under other conditions.

It leads us to the paradox: optimal answers are not necessary the best answers. Our job is not only to succeed, but also to avoid failure. This fourth step is the most difficult to grasp because it forces us to consider unpleasant possibilities and unplanned events. However, it is exactly a "robustly designed" supply chain that will ensure your company's survival under nearly any circumstance.

One Final Note on the Four-Step Methodology

Rarely will a company go from phase to phase completely. Rather, most companies already have a network structure they wish to modify, as opposed to starting with a complete "blank sheet of paper." Sometimes many of the policies are fixed, but we want to do contingency planning. Perhaps we need to identify whether our current structure can handle what we expect to happen, but if "that other thing" happens, what will the new optimal structure be? Strategic planning, at its core, cannot simply be "automated." Since the context and the problem are so completely intertwined, you can never take the man out of the loop – and that is exactly what makes strategic decisions so difficult to make properly.