

The 6 Forces Driving Supply Chain Design

The supply chain is a bigger competitive differentiator than ever. But there's no one right way to design it. And the factors to consider have changed. An interview with David Simchi-Levi.

[Note: The following are edited selections from the complete interview, coming soon to sloanreview.mit.edu.]

Can you offer some history? How has supply chain thinking evolved?

A perspective on the last 30 years gives us an insight into what has happened in the profession. In the 1980s, there was a lot of focus on just-in-time production, lean manufacturing and discrete systems. In the 1990s, starting from around 1993, you saw companies realize there is a limit to how much cost savings they can obtain from the manufacturing side, and they began to look for other ways to squeeze cost and improve operations. One attractive way was supply chains. We saw a shift in focus to supply chain collaboration and the outsourcing of logistics activities.

In the last 10 years, of course, there's been the emergence of the Internet. There was a lot of excitement that it would change the way supply chains are managed and have a huge impact on procurement, in particular, because it allows you to put suppliers in direct competition. And the Internet did, in fact, completely impact the procurement part of the supply chain in many organizations.



Among the most important emerging drivers of supply chain design is the significant increase in the volatility of commodity prices.

And now looking forward? Your research shows that in just the last few years there has been a fairly dramatic increase in new trends and challenges affecting supply chain design. Let's go through them.

There are six trends, and they all present challenges to thinking about supply chain management.

The first is globalization, an old force that continues to morph and that is producing longer and longer lead times.

The second is the significant increase in logistics costs, due to changes in transportation cost and inventory. In the last five years, transportation costs have increased by more than 50% because of energy prices. Inventory increased by more than 60% between 2002 and 2008. It's directly tied to the rise in transportation costs: As transportation costs increase, companies try to take advantage of economics of scale by shipping large quantities.

The third trend is the increase in the level of risk that many companies are exposed to. This flows from embracing strategies like lean manufacturing and outsourcing and offshoring. Lean typically implies low level of inventory, and that means that when there is a disruption, the supply chain cannot meet supply and demand. Similarly, offshoring and outsourcing imply that the supply chain is geographically more diverse, and therefore, exposed to all sorts of disruption.

The fourth trend is a significant increase in labor cost in developing countries. In the last 20 years, globalization, of course, has been the focus for many companies, but it was premised on an underlying assumption that it was low-cost manufacturing. But if you look at the last five years, the labor cost in China increased 20% year by year, on average. By comparison, it was up by 3% in the U.S. Companies that made production-sourcing decisions five years ago based on labor costs may need to revisit their decisions.

The fifth trend is the way companies are starting to focus on sustainability. It's especially acute in Europe, which has a developing so-called green supply chain. In some industries this will play out as an increase in regulations companies have to follow, and will require thinking about how much carbon your supply chain produces.

The sixth trend, which is very important, is a significant increase in the volatility of commodity

prices. Volatility is a big challenge for companies because when you're procuring any commodity from oil to coal to steel and you need to sign a contract, it's not clear if you should seek a commitment that's long term or short term. If you sign a long-term contract, you need to outguess the market. That's what happened, for example, to Northwest [Airlines] when oil prices were going up: They signed a long-term contract for a certain price per barrel of oil. And oil prices went down and they were stuck with this long-term deal.

I could imagine a manager saying, "We're already dealing with each of those factors individually — no news there." But is there something about the way they interact now that demands a different kind of management response?

Absolutely. It's the combination of all these forces that makes managing the supply chain an enormous challenge. If I told you that you needed only to deliver on globalization, you'd say, "No problem," and weigh low cost versus long lead time. But what if on top of that I told you that you'd now also need to keep in mind that as you have longer lead time, you're exposed to different types of risk, and, by the way, the labor cost savings from shifting work to Mexico, for example, have shrunk.

What's more, supply chain management has mostly been focused on cost reduction, and that's one of the most critical mistakes a company can make, depending on its customer value proposition. Customer value, product characteristics, channels to market — all those considerations combine to require different kinds of supply chains.

Can you give us some examples of what you mean?

Dell, for instance. It focused on the direct consumer model, which meant a very efficient supply chain and a flexible business model where the value proposition is customer experience. It had a huge collection of components to select from. Customers could match what they wanted with what Dell had in their online system.

A year and a half ago, Dell announced they're going retail. When you go retail, the challenges are completely different. Now, the question for Dell is what type of supply chain do I need? One supply chain for

everything? Different supply chains for different parts of the business? Different channels have an impact on supply chain strategy, and the channels are related to customer experience and customer value.

In the online channel — the direct consumer model — the value proposition is, as we've said, customer experience. In the retail business, the value proposition is price. You offer competitive prices, customers come. In retail, customers don't see a huge collection of products. They see a small set, and you compete directly with other vendors who are also providing low-cost products. The supply chain that supports the online channel is not the same as the supply chains that support the retail channel.

Another example is Wal-Mart. When you think about customer value in general, it's multidimensional. Customers could find value in price, in quality, in selection, in branding. No company can be successful on all the dimensions. Wal-Mart says

What are the implications of the six trends strategically? What do companies need to weigh when thinking about how to design their own supply chains?

I think the six forces that we have identified have a number of implications that cannot be ignored. There are four, in fact.

One is risk management. If you take the sum of the six trends, then risk management should be something embedded in the supply chain culture, not outside of it. Back when companies first started to outsource in significant numbers, of course, they began considering risk, but that was when the level of volatility was relatively low. Remember, everything was about cost reduction, about lean, about outsourcing, and now, all of a sudden, everybody sees this potentially creates huge problems. That's changed.

And, by the way, when we think risk management, we think about two types of sources of risks.



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it's going to compete on price, and so the supply chain that is supporting it is focused on cost.

That's not the case for a company like Amazon. The customer value proposition that Amazon provides is a set of choices. You go there, and you see a huge store where you can select anything. They're focusing on responsiveness. They're focusing on service level and customer service. The supply chain that needs to support this type of customer value is different than the supply chains that need to support an everyday low-pricing strategy.

But Amazon also competes on price.

It's true, but what I said is you cannot dominate on all the dimensions. You select one dimension and say, "Look, this is the dimension I dominate. In the other dimensions I may have superior performance, but I'm not dominating." On the other hand, when you think about Wal-Mart, they dominate on price. Service is also their focus, but they don't dominate on service.

One I call the "known-unknown": sources of risk for which you have a lot of data, like an operational problem or lead time. Companies have thought about and put processes in place to manage those fairly well. But in the last few years we saw also the impact of the "unknown-unknown." These are the risks like epidemics, earthquakes, geopolitical problems, where there is no data on the sources. It's very difficult to predict or build models for these risks.

The second management implication of those six forces and how they interact is the need for visibility. Visibility into operations becomes a critical part of managing the supply chain. Think about three levels of visibility. One is, I just want to know where my products are in the chain, as they are moving over the ocean or they are on a truck. This is the lowest level of visibility. It allows you to improve responsiveness. It does not focus necessarily on cost, but it's a great way to improve service. The second level of visibility is to say, Look, I'm not only

interested in knowing where my stuff is as it moves from one node in the supply chain to another. I also want to know what exactly is the production plan of my supplier so that when he starts executing, I will know what to expect. I want to know he received his raw material from his supplier, so I know he's going to execute on my order, and when. That's a different level of visibility. That I call pipeline visibility. The third level of visibility is track and trace. That's where there are sensors, and not necessarily even on the product itself. Maybe on the pallets, maybe on boxes, maybe on containers, so that I better utilize my resources. This is the highest level and the most expensive. Not everybody needs that level of visibility in order to improve supply chain performance. My point is, as you look at this spectrum and are starting to think where you are, what is your objective? Is it cost? Is it service? Is it coordination? Different types of visibility offer different benefits and have different requirements.

The third implication is a shift in thinking about globalization. The mantra behind globalization was low-cost country sourcing. But with increasing oil prices and the increase in labor costs in developing countries, this mantra is dead, basically. It's not that everything is going to become regional, but there will be more sensible, hybrid approaches to supply chain management that combine regional and global activities. We see companies that used to produce in the Far East moving their manufacturing activities much closer to market demand.

And the fourth implication is a real need to focus on flexibility. With the increasing level of volatility, the days of static supply chain strategies are over. Flexibility is the ability to respond to change in demand volume, demand mix, maybe transportation cost, maybe even labor cost. Flexibility doesn't come free. But it turns out that even a small amount of flexibility can give you almost all the benefits of full flexibility. Example: Making sure each plant is capable of producing not only one product but a small number of products provides you almost all the benefit of full flexibility by enabling adjustments to production-sourcing decisions to better meet supply and demand. Companies now understand they need flexibility. The question is: How much flexibility do we need and to what benefit?

Now, thinking about all this is not a guarantee



that you'll be successful at any of it, but it increases the likelihood of success. There is no one-size-fits-all, ideal supply chain strategy. Even when you look at the supply chain design of a company making a product that looks similar to yours, yours may have some conflicting attributes and characteristics that should push you in a different design direction. One thing is sure, though: If you go with a random match between strategies and challenges, then you are guaranteed to fail.

What do you think the smartest supply chain designers will be thinking about in years farther ahead?

Five years from now, 10 years from now, the emphasis is going to be on technology. It's going to be on processes that allow companies to monitor, to plan, to execute and then to adjust. It's not going to be everybody talking about KPI, key performance indicators. It's going to be about predicting where those indicators are going to be a week from now because you can see out onto your supplier chain and anticipate.

People don't already do that?

This is very difficult to do because you need to synthesize data across the entire supply chain and integrate plans with what's happening on the floor at the ground level. That's not easy. It seems obvious, but the technologies that you need to do that and the processes to do it, that's what makes it very difficult. And the process that's appropriate for one company won't be appropriate for another.

What kind of supply chain, or chains, does Dell need, now that it is adding a retail channel to its traditional customer-direct business?