

What Makes a **LEAN**



CELIA JOHNSON

Supply Chain?

By Kate Vitasek, Karl B. Manrodt, and Jeff Abbott

Six core attributes characterize the lean supply chain. They range from the ability to capture and communicate the demand signal to successful collaboration with supply chain partners. The industry leaders that have developed these lean competencies enjoy a competitive edge that is manifested in smoother operations, lower stock levels, and greater inventory turns.

As more and more companies adopt a “horizontally integrated” business model, they are seeking to perform in house only their core functions, while outsourcing the noncore activities. In manufacturing, this means shedding a company’s own plants and turning to domestic and international contract manufacturers. It also means sourcing from far-flung parts of the globe and relying on third-party providers for the necessary logistics support. This contrasts sharply with the old-world “vertically integrated” approach in which everything from basic raw materials

to end customer sales might be under the control of a single global enterprise.

With the move toward horizontal integration, the supply chain has lengthened and grown more complex. And with this heightened complexity comes a new set of challenges. How do you manage a global supply chain while retaining speed and flexibility? How can you eliminate waste across the supply chain—not just at one point in the channel? How can firms collaborate in a way that is mutually rewarding? How do you meet the needs of a global customer without excessive work in process or inventories? And, most importantly, how do you accomplish all of this in the face of shrinking margins?

Some industry leaders are finding the answers in a business approach with roots deep in manufacturing: lean. Specifically, they are applying the lean production principles to the management of their global supply chains.

The Lean Supply Chain

A number of sources have detailed the basic principles of lean manufacturing. Two of the most authoritative are *Lean Thinking* and *The Machine That Changed the World*, which described the famous Toyota Production System. Both of these books, which are still widely available, were co-authored by lean experts James P. Womack and Daniel T. Jones. As these authorities point out, the overarching objectives of lean are to eliminate waste in both materials and processes and to create value. Importantly, value is defined from the perspective of the customer. If an activity or process does not add customer value, then it is considered waste.

While the principles of lean have been applied in the manufacturing space for several decades now, the notion of lean supply chain management is relatively new. To help supply chain professionals gain a better understanding of how lean can be applied to their operations, we conducted research that included extensive literature search, case studies, and interviews with industry experts. We also conducted a survey among members of APICS, an organization of supply chain and resource management professionals, to gauge progress toward implementing lean principles. (For more on the APICS survey, see sidebar above.)

That research effort led to the identification of six attributes that companies should cultivate to build a lean supply chain that is creative, flexible, and adaptive. Through the APICS survey results in particular, we were also able to quantify the competitive advantages of developing lean supply chain capabilities.

For the purpose of this article, we define a lean supply chain as a set of organizations directly linked by upstream

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Research Methodology

In August 2004, APICS asked 5,806 of its members to participate in an online survey of lean supply chain practices. Six hundred and eight members participated in the study, representing a 10.5 percent response rate. Given that online surveys of this type normally have a response rate in the single digits, the level of participation exceeded our expectations. The large sample enabled the research team—the authors of this article—to reach conclusions with a high level of confidence. (A copy of the full report, titled “Understanding the Lean Supply Chain: Beginning the Journey,” can be downloaded at no charge at www.manrodt.com or www.scvisions.com.)

The survey was based on an extensive literature review, earlier research we had conducted, and input from subject experts at Oracle Inc., another participant in the study. In addition to the e-mail survey, the research team interviewed supply chain professionals from a wide range of industries regarding their efforts to apply lean concepts to their supply chains.

More than 71 percent of the respondents are in manufacturing, which places them near the middle of the supply chain. From this position, they had a perspective on both upstream and downstream supply chain activities. With respect to size of the business, 30 percent of the respondents had annual sales in excess of \$1 billion. The remainder had sales of under \$1 billion.

With regard to size and type of the responding companies, we had early concerns that these demographics could significantly impact our results. Yet while we did find some differences in individual responses, there were no significant differences among the groups. No industry group appeared to be leading the race to develop a lean supply chain, and smaller and larger firms seem to be making equal progress in adopting lean principles.

and downstream flows of products, services, finances, and information that collaboratively work to reduce cost and waste by efficiently pulling what is needed to meet the needs of the individual customer.¹ While individual firms can become lean by themselves, a lean supply chain requires multiple entities to work together. It’s important to understand up front that lean supply chain management is not an exercise in shifting inventories or costs to a supplier. Instead, it’s a coordinated effort among partners to eliminate waste across the supply chain. This can only be done by collaborating across common processes.

So Why Be Lean?

Why work to develop the lean supply chain attributes in the first place? Doesn’t it take a lot of time and effort? And don’t we all have enough on our plates as is without adding another project?

To help answer these questions, the research team turned to the APICS survey. We segmented the survey sample into three groups. On the lower end of the scale were those respondents who had not implemented any lean supply chain

practices—and had no firm plans to do so. This group consisted of approximately 60 percent of the sample and will be referred to as the “nonadopter” group. In the second group were the lean adopters—the companies that had integrated their product flow and were working with supply chain partners to become leaner. Lean adopters made up around 15 percent of the sample. The third group (the remaining 25 percent) was in the middle; they had adopted some lean principles internally and were working to extend them out to suppliers and customers.

The most striking comparisons were between the adopters and the nonadopters. In particular, we found the following statistically significant differences between the two groups:

- Lean adopters see exchange of data as a tactical advantage and are more likely to work with partners on data standards to enhance information integration (40 percent vs. 11 percent of nonadopters).

- Lean adopters see employees as a valued asset and emphasize employee development (77 percent). Nonadopters are less likely (47 percent) to provide support for development programs and, in general, view employees as more expendable.

- Lean adopters are more likely to have continuous improvement programs (80 percent). Of the nonadopters, 43 percent indicated that they have no such programs.

- Lean adopters are more likely to collaborate with supply chain partners on process standards. Nonadopters are significantly less likely to do so.

- Lean adopters are more likely to enforce company product standards (63 percent). Fully half of the nonadopters indicated weak enforcement of company standards or had no standards at all.

- Lean adopters participate in standards bodies and work with partners on standards (48 percent). Nonadopters were less likely to do so; 34 percent either use no industry standards or attempt to enforce their own standards on the group.

- Three-fourths of the nonadopters either don't share data with key partners because they consider it to be proprietary or, if they do make data available, offer no conversion assistance.

The research also revealed sharp differences in how the two groups performed on the key logistics metrics of inventory turns and the number of days of sales in inventory. As shown in Exhibit 1, lean adopters had statistically significantly higher inventory turns as well as lower days' sales in inventory on hand. And because the leaders are not carrying excessive levels of inventory, their cost of goods sold is lower and they are better able to respond to changes in the supply chain. In short, they are enjoying two of the key benefits of lean supply chain management.

Our research further suggests that the lean adopters communicate and collaborate more successfully with their supply

chain partners. They have a higher use of standards in processes and materials. The lean adopters also enjoy reduced SKU counts and inventory levels and report a general reduction in cost of goods sold when compared to the nonadopters. Notably, all of these factors contribute to the bottom line.

Attributes of a Lean Supply Chain

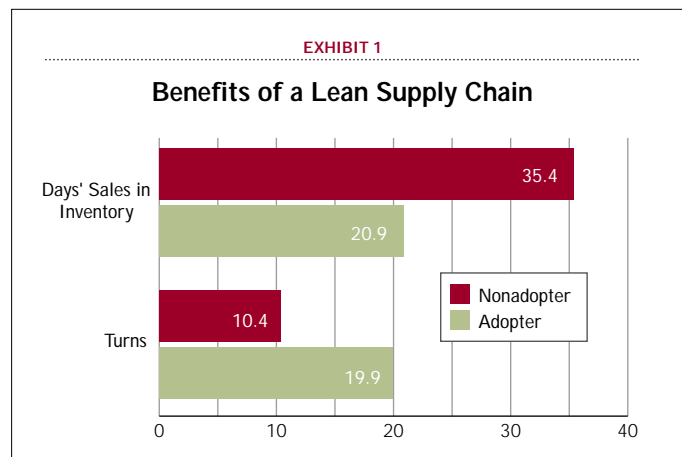
How do companies develop the lean supply chain capabilities that will lead to the kind of superior supply chain performance demonstrated by the top adopters and the industry leaders? We've identified six attributes that companies should strive to develop.

1. Demand Management Capability

An underlying tenet of the lean philosophy is that product should be “pulled” by actual customer demand rather than “pushed” into the market. Ideally, point-of-sale (POS) data is gathered in real-time, or near real-time (daily), and transmitted upstream to all the supply chain members. This doesn't mean just the tier one suppliers but the tier two and tier three suppliers as well. Thus, suppliers at each level of the process would receive the customer's demand signal and convert it into something usable (such as part number and quantity) for their upstream partners. In this way, all members in the channel can understand the total volume being sold. Over time, this capability should minimize the need for forecasting, since the supply chain is responding to actual demand.

The consumer goods sector provides some good examples of effective demand management in a lean supply chain. In particular, the techniques of collaborative planning, forecasting, and replenishment (CPFR) and efficient consumer response (ECR) are enabling point-of-sale data to drive store deliveries. In effect, the retail manufacturer/distributor only delivers stock to the store when specified by a pull signal for a specific quantity issued from the retailer.

Gillette is one of the best practitioners of demand man-



agement in the consumer goods space. Gillette receives actual demand data from POS systems at the retailers and uses that data to create replenishment orders to ship just the right amount of a product to each store. The company is even working to develop radio-frequency identification (RFID) processes that could ultimately lead to continuous monitoring of backroom and shelf inventory, providing automated notification when replenishment is required.

The consequences of not managing the demand signal have been well documented. The biggest problem is often referred to as the “bullwhip effect,” whereby additional units are added to the original demand signal as it moves further upstream. For instance, an order may grow 10 percent at each node as it moves from the retailer to the distributor, then to the manufacturer, and then to the tier one suppliers and their suppliers. The result is excessive inventory held by all of the channel partners, which makes it much more difficult for everyone to respond effectively to change.

Our survey of APICS members showed that while many companies understand the importance of getting demand data from customers and to suppliers, they have a long way to go toward achieving that goal. The majority of respondents are basing their manufacturing and supply chain planning on usage history or on projected sales based on usage rather than actual demand. Less than 50 percent of the respondents reported any kind of ongoing dialog with the downstream supply chain to improve demand-data accuracy and timeliness. Only 33 percent indicated that product was being “pulled” through the downstream chain by actual usage. Of those, just 15 percent indicated any “real-time” exchange of actual usage data with their customers.

There has been much discussion about companies competing “supply chain vs. supply chain.” If this is to become a reality, all of the supply chain partners will have to do a better job of managing the demand signal. The lean supply chain runs on knowing what is actually being sold, at what quantities, and where the sales have taken place. Results of our study suggest that there is significant room for improvement on this key attribute.

2. Waste and Cost Reduction

Elimination of waste is another key tenet of lean supply chain management, just as it is with lean manufacturing. In the broadest sense, waste can be time, inventory, process redundancy, or even digital waste. Digital waste is especially detrimental to the supply chain. It refers to redundant or unnecessary data that is collected, managed, and stored for no tactical or strategic reason. The amount of digital waste with-

in an organization is typically great. It increases exponentially when one considers the data flows among members in a supply chain.

Note that the emphasis here is on reducing waste, and not cost. This is not a matter of semantics but of philosophy. There’s not always a direct one-to-one correlation between eliminating waste and cutting costs. Yet waste reduction almost always results in lower costs. In the supply chain context, the elimination of waste yields a significant by-product: a reduction in costs for all members of the supply chain.

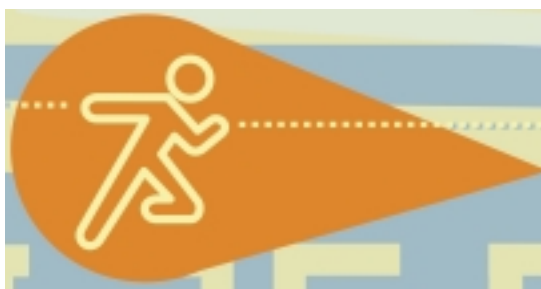
A focus on waste, and not cost, also makes the conversation with suppliers and customers less threatening. If the goal is to reduce waste, most parties are more willing to discuss their processes with one another. A cost-cutting program, by contrast, is often seen as just another way of squeezing a little more out of the suppliers or service providers.

With a joint goal of reducing waste, supply chain partners can work together to modify those policies, procedures, and data-collection practices that produce or encourage waste. Typically, waste across the supply chain will manifest itself in excess inventory. Effective ways to address this are through postponement and customization strategies, which push

the final assembly of a completed product to the last practical point in the chain.

Dell provides an excellent illustration of how to reduce waste in the supply chain through effective demand management. The company’s build-to-order model produces a computer only when there is actual customer demand. Dell works closely with its suppliers on reducing inventories and improving processes to achieve a system where inventory turns are measured in hours rather than days. Thus, Dell is able to introduce new technologies such as faster CPUs much more quickly than the competition. In fact, it can start shipping computers with the new technology the very day that it becomes available from, say, Intel—without concern about flooding the supply chain with excess or obsolete processors. And since Dell does not maintain stocks of unsold finished goods, there is no need to conduct “fire sales” to unload complete computer systems that are considered out of date. The result: Waste has been eliminated both on the component side and on the finished goods side.

Most of the respondents to our survey have yet to reach Dell’s level of performance in this attribute. Less than 20 percent are working with their supply chain partners to eliminate waste. Again, this is clearly an area of lean supply chain management with much room for improvement.



Lean adopters had higher inventory turns and lower inventory on hand than the nonadopters.

3. Process and Product Standardization

Process and product standardization is the third attribute of a lean supply chain. It's important to develop standardization across both processes and products for the reasons elaborated below.

Process standardization enables continuous flow—that is, the uninterrupted movement of a product or service through the company's system and to the customer. Major inhibitors of flow include work in queue, batch processing, and transportation issues. These roadblocks slow the time from product or service initiation to delivery.²

Continuous flow needs to be accomplished with a “value stream” perspective, which means viewing processes in terms of how they add value to the customer. This perspective demands a shift from vertical to horizontal thinking. Horizontal thinking requires that managers look across the traditional vertical functions to integrate activities in a value stream that flows from suppliers, through the organization, and on to customers.³ This effort is facilitated by having processes that are standardized across the supply chain to reduce complexity. In other words, the organization first determines the best way to manage a process and then standardizes this process across the organization, taking into account regional or cultural differences.

Here we think of the Toyota Production System, the foundation for most lean and just-in-time strategies. Toyota's emphasis on standardized processes and tooling has led to a significant reduction in the time required to manufacture an automobile. While each new Toyota car and truck model may appear to be different from one another, the processes involved in bringing these vehicles to market are very similar. This approach allows Toyota to focus on perfecting both the new vehicle and the underlying processes used. Toyota also is well-known for working with its suppliers to help them adopt similar lean practices, which extends the benefits of standardization across the supply chain.

A thorough understanding of the value stream will help supply chain partners standardize important processes and shift work to the most efficient point in the chain. Yet, for many companies, this remains a challenging task. Planning and production, two key processes that pertain to most organizations, are examples. Fewer than 20 percent of respondents to the APICS survey reported that these processes were “well understood.” Further, only 6 percent indicated that these processes have been standardized across supply chain partners. More than 30 percent said that their processes were “proprietary” and

therefore not shared with their supply chain partners.

In addition to standardizing processes, companies can benefit from standardizing products used in the manufacture or assembly of goods—in other words, sharing subcomponents across product lines. In this way, fewer unique components are needed, thereby reducing manufacturing, warehousing, and development costs. Component standardization also can help promote postponement initiatives that, in turn, can reduce inventory levels of finished goods. Take, for example, a large original equipment manufacturer (OEM) that bundles various software games with its gaming console for different retailers. Instead of having a “Costco” SKU and “Best Buy” SKU that was customized at manufacturing, the OEM shifts this value-added activity downstream to its distribution partners. So when Costco purchases products, the distribution partner generates the customer-specific SKU and does the bundling and labeling. By performing the value add activities downstream at distribution rather than at manufacturing, the OEM streamlines its inventory with one generic gaming SKU rather than having a separate SKU for each retailer.

As our full report notes, more than 88 percent responded that they were making some efforts to standardize products internally, with nearly 40 percent actively involved in processes used to establish and use internal product standardization.



Cultural change is one of the biggest challenges in getting lean accepted in the organization.

4. Industry Standards Adoption

Standardization also needs to extend beyond a company's particular supply chain to the industry overall. Industry product standards benefit not only consumers but also companies by reducing the complexity of product variations. The consumer electronics industry provides many examples of effective use of cross-industry standards—from the pin arrangement for various electronic components, to the size of a hard disk drive used in a computer, to the dimensions of the racks for mounting telephone switching equipment.

Industry standards help ensure that components from various suppliers can be used interchangeably, thereby reducing development costs for the original equipment manufacturers and allowing for standardized processes in assembly. To illustrate, the popular USB memory stick products have become a great tool for transferring large amounts of data. Without a standardized USB port, however, a universal memory stick would not have been possible. Had each computer manufacturer developed its own solution for a USB port connection, we would have needed as many different memory sticks as there were computer models.

Today, the majority of components in a personal computer

manufactured by Dell or HP are the same for any given performance and quality level. The biggest differentiators are the name on the box, the marketing strategy, and the after-market support. Ever wonder how we can now purchase an entire computer system of good quality from a leading name vendor for under \$500? Industry-wide standardization is a big reason.

With regard to process standardization in the supply chain space, industry associations like the Supply-Chain Council and APQC are taking a lead role. APQC, for example, has developed a Process Classification Framework (PCF) that establishes a common nomenclature for various activities ranging from human resources to supply chain management. Based on the premise that organizations have similar processes for many activities, the framework allows companies to “get on the same page” with respect to process definition. The Supply-Chain Council’s SCOR (supply chain operations reference) model defines common supply chain management processes across the plan-source-make-deliver-return spectrum. Frameworks like those offered by APQC and the Supply-Chain Council help companies talk about their supply chain processes in a common language.

Industry standardization also should extend to information. As companies increase their supply chain systems capabilities, they increase the amount of data to organize, understand, and leverage. Add in RFID capabilities, POS data, and communication with trading partners, and the data increases exponentially. To effectively manage this level of data, supply chain partners should adhere to industry standards for exchanging information wherever possible. Groups such as the Rosetta Net, VICS (Voluntary Interindustry Commerce Standards), and GS1 US (formerly the Uniform Code Council) are leading the way for companies to improve their data communications through standardized data formats.

On this attribute, our survey results show that roughly 70 percent of the respondents make use of industry standards when developing new products. But fewer than 20 percent are using standardized formats to exchange information between supply chain partners. Twenty percent of the survey respondents consider their data to be proprietary and make no attempt to share it with their partners. Another 42 percent of those surveyed simply make the data available without making any effort to help their partners use it.

5. Cultural Change Competency

There is one recurring obstacle to successfully applying lean supply chain concepts—resistance from the people who will be asked to embrace and implement the change. These are the same people who have been doing things the old way for a long time—and, in fact, have a vested interest in doing things the way they have always been done. Cultural change is one of the biggest challenges in

getting lean accepted in the organization.

Successful cultural change requires a clear roadmap. During times of change or uncertainty, employees want to know where things are headed. What does the future look like? What will I have to do differently in order to succeed? Done properly, a lean supply chain initiative can provide a “roadmap” that provides employees with that long-term perspective. It can clearly communicate the objectives and benefits of going lean. The roadmap then can map how the company will move from the “as is” condition to the desired state. And as with any major change management initiative, the lean roadmap must have the unconditional support of top management.

The company’s view of its people within the organization also is crucial to successful cultural change. In this regard,

it’s interesting to note how lean adopters view their employees as compared to nonlean organizations. The adopters tend to view their people as valued assets and place significant emphasis on employee development. In contrast, nonadopters are more likely to see employees as expendable and provide little support for development programs.

Nearly 70 percent of the respondents to our survey report having programs in place to enhance employee development and reduce turnover. While the survey did not ask specifically about training programs targeted to lean supply chain management initiatives, such programs would clearly be central to developing this attribute.

During our interview process, we found that leaders in lean adoption were emphasizing lean and total quality management (TQM) training as part of the new employee indoctrination. Over time, this thinking becomes ingrained in these individuals as the way they do business. Several of the leaders we spoke with tackled cultural change through formal training programs led by a “lean team” of subject-matter experts. These experts would work with various business units within the company not only to do the formal training but also to take an active role in implementing lean supply chain initiatives.

6. Cross-enterprise Collaboration

The final attribute of the lean supply chain is cross-enterprise collaboration. Through collaborative practices and processes, supply chain partners must work to maximize the value stream to the customer. To do this right, of course, it’s necessary to first understand how the customer defines value. Added services, regardless of how the supply chain partners view them, are of true value only if the customers understand and desire them.

Cross-enterprise teams are a major enabler of supply chain collaboration. In a lean supply chain, these teams are not functionally oriented or internally focused. Rather, they are

(Continued on page 45)



oriented toward the whole supply chain and work toward solutions that benefit all of the members. The most effective teams comprise members from all of the end-to-end supply chain partner companies. The team members should represent all of the principal supply chain functions of plan, source, make, and deliver as well as the enabling functions of finance and technology.

The best examples of collaboration in the supply chain come from the retail sector. Giants such as Wal-Mart and Tesco have implemented collaborative processes with suppliers that allow them to reduce their backroom stock while improving shelf availability for the consumer. Both of these benefits result from close cooperation and communication between these large retailers and their suppliers.

In terms of our survey respondents, nearly 90 percent have implemented some form of cross-functional teams, but less than 25 percent have cross-enterprise supply chain teams in place. Developing the collaboration attribute not only improves the working relationships among the supply chain partners, but also creates a positive atmosphere that contributes to the success of future supply chain initiatives.

Where To Start?

There's an implied assumption in articles such as this that all of the principles espoused deserve equal emphasis. Put in terms of the lean supply chain, you have to develop all six attributes at the same pace and to the same degree. Yet, few things in life work that way. Runners have stamina and lower body strength, but don't spend a lot of time building upper muscle mass. Tennis players often have incredible strength on one side of their body, but not the other. In the same way, companies have to focus on those attributes that match their strategies, their supply chain capabilities, and their competitive positioning.

If you could focus on only one lean attribute—and only one improvement—in your supply chain, it should be the demand management capability. Effectively managing the demand signal across your organization and then communicating that signal to your suppliers will reduce waste, cut costs, and ultimately lead to higher supply chain performance.




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How do you begin to focus more intently on the demand signal? A good starting point is to create a process map that charts all of the steps involved in moving the demand signal from the end user into your organization and on to your suppliers. Once you understand the key processes, you can then work to improve them. Answering a few questions like these will point you in the right direction.

- How can the signal's velocity be increased?
- What are the benefits of increased velocity? Who benefits?
- Who sees the signal now but doesn't use it?
- Who doesn't see the signal but could benefit from it?
- What are the roadblocks that hinder the signal?
- What support or training is needed?
- What metrics need to be put in place to measure and encourage changes?
- What compensation plans are in place that may run counter to this initiative?

Creating a lean supply chain is not an easy assignment. Lean supply chain management, much like lean manufacturing, is not a destination, but a journey. And as with any strenuous journey, the big question is always, "Is it worth it?" Our data—both qualitative and quantitative—confirms that the journey is worth the time and effort. By working to develop the six attributes described here, companies and their supply chain partners can greatly improve their overall performance while delivering greater value to the customer.

Beyond this, your competition is likely considering a lean future. Can you afford not to take the lean journey? 

Footnotes

- ¹ This definition is based on the work of the Council of Supply Chain Management Professionals as well as the University of Tennessee Supply Chain Research Group.
- ² Dave Nave, "How to Compare Six Sigma, Lean and Theory of Constraints," *Quality Progress*, March 2002.
- ³ Mike Rother, "What Are We Learning Since We Started Learning to See?" www.lean.org.