

Lean Transportation – Fact or Fiction?



Lean Transportation – Fact or Fiction? An Executive White Paper

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Executive Summary

Lean Manufacturing continues to increase in strategic popularity as organizations strive to increase flow of material and reduce waste at all levels in the supply chain. Yet, what does this really mean to transportation? Is there such a thing as Lean Transportation?

Lean Transportation – Fact or Fiction? is an executive white paper that discusses how Lean Principles integrate into the transportation function. Written in a practical and informative manner, this white paper reviews key lean principles and how they apply strategically and operationally to transportation management. In addition, the reader will be introduced to the *Four Critical Laws of Lean Transportation*. Effective execution of these Lean Transportation laws will allow the practitioner to identify and eliminate waste in transportation.

The paper will also discuss how to manage transportation costs while implementing the key Lean Logistics principles of Lot Size Reduction, Increased Delivery Frequency and Level Flow.

This white paper is a must read for all Transportation, Logistics and Supply Chain managers who are attempting to understand and apply Lean principles to the transportation function.

Lean Transportation – Fact or Fiction ?

If you are involved in manufacturing today, your organization is most likely engaged in implementing Lean Manufacturing techniques. As Lean is expanded beyond manufacturing, the question is raised about how Lean can impact transportation. In order for the benefits of Lean to be fully realized, transportation management needs to integrate into the Lean implementation. What does this mean to the practitioner? Is there actually something that can be called Lean Transportation? If so, exactly what benefits will Lean produce for the transportation function? Answering these questions is not easy. In fact, many answers seem counter intuitive and somewhat confusing to the logistician. This white paper will examine how four lean transportation laws can be applied to transportation management to reduce waste and create efficient process.

What is Lean?

“Lean” is defined in many different ways by practitioners, educators and thought leaders. Here is a sampling of common Lean definitions and goals.

1. Lean is an organizational methodology designed to create a learning organization through a culture focused on relentless problem solving and teamwork.
2. Lean is a philosophy based on lead-time reduction from customer order to delivery. Reducing lead times make an organization more flexible and responsive. Benefits of short lead times include fast feedback loops, responsiveness to the customer (short lead time) and elimination of supply chain costs related to inventory tracking and inventory carrying costs.
3. Lean is a manufacturing method based on manufacturing strictly to customer demand and focusing on one-piece flow. The purpose is to eliminate any chance of over production that will result in excess, unnecessary and costly inventories.
4. Lean is an operational model that discounts the value of economies of scale and focuses on cost reduction as a result of small, incremental continuous improvements.
5. Lean is a set of tools to reduce waste, where waste is defined as any non-value added process. A non-value added process is defined as any process for which the customer is not willingly to pay.

The elimination of waste is a fundamental aspect of Lean and seven wastes have been identified and defined:

Figure 1: The Seven Wastes According to Lean Thinking

Waste	Description
Overproduction	The king of waste. Many of the other wastes are created when we produce more than the market demands. Lean focuses on building to “takt time” which means the “beat of the customer” in order to avoid overproduction.
Inventory	Inventory in excess of what is required to service the customer is waste. This is caused by overproduction, forecasting errors, long lead time and batch thinking based on economies of scale paradigms.
Correction	Waste that is created when we are doing things over because they were not done right the first time.
Over Processing	The waste that is created when we do more than is required to meet customers needs.
Motion	All motion that does not add value to the product or process. Walking around, searching for material or tools.
Waiting	All waste that exists because we are waiting for material, people, up stream processes, customer orders and all other dynamics that result in waiting time before we can perform our work.
Transportation	Transportation in excess of what is required if inventory and flow exist in the network. This includes underutilized equipment, inter-plant shuttles, trailer demurrage and other transportation wastes.

Transportation allows organizations to deliver the right goods in the right quantity to their customers at the right time, yet excess transportation movement creates waste and added costs to the customer. Customers are generally willing to pay for transportation decisions based on supporting the 8 Rights.

The 8 Rights	
1. Right Materials	5. Right Source
2. Right Quantity	6. Right Price
3. Right Time	7. Right Quality
4. Right Place	8. Right Service

Figure 2. The 8 Rights fundamental goals of logistics. Transportation processes must efficiently support these 8 Rights without creating excessive material movement

Transportation is a necessary component of most businesses and adds value that is recognized by customers; consequently it should be considered a strategic part of any operation. However, there are often hidden wastes within transportation. Transportation waste is often a result of deploying excess assets (inventory) to cover transportation lead time and lead time variances. Four lean transportation laws can explain where and how transportation processes may be suboptimal and how the application of lean in transportation can positively impact overall organizational performance.

Lean Transportation Law #1 – The Law of Transportation Waste

All transportation is not waste and transportation can be used as a strategic differentiator. However, transportation in excess of what is required is waste and should be eliminated.

Holding the above law as truth creates more questions than answers. For example, how is excess transportation identified? How can visibility of excess transportation be evident in order to eliminate the waste it creates?

The Lean Transportation Paradox

Many Lean transformations often hit a brick wall when tactical plans are given to transportation managers. Lean is typically implemented first in the manufacturing operations and external transportation is often an after thought. Lean implementation in manufacturing is centered on the implementation of small batch manufacturing, one-piece flow and the reduction of inventories. Consequently, the transportation manager is challenged with the task of moving smaller quantities more frequently for both inbound and outbound shipments. This may seem extremely counter intuitive since it contradicts traditional large lot size based cost efficiency assumptions. It becomes easy to discount Lean from a transportation point of view. Compounding this paradox is the fact that many transportation managers are measured and perhaps compensated on transportation cost-based metrics. This creates an environment where transportation professionals may not embrace Lean initiatives under the assumption that smaller, more frequent deliveries and shipments will only serve to drive up transportation costs.

These assumptions must be challenged. Embracing Lean effectively can reduce shipment sizes, reduce inventories, and reduce transportation costs in the process. Lean transportation can be used as a customer service differentiator by minimizing the time product takes to reach the customer. Reducing the length of the supply chain and getting new products to customers faster is a constant challenge for manufacturers. Applying the 8 Rights in a lean manner will create a competitive strength. The critical component is to recognize that transportation must support Lean strategies based on inventory reduction to create supply chain velocity. This leads to our second Law of Lean Transportation.

Lean Transportation Law # 2 – The Law of Transportation Strategy

Transportation strategy and execution should support inventory strategies designed to support customer expectations. Inventory and customer strategies should not be a result of transportation strategies based on silo optimization of the transportation function.

Transportation strategy should not drive how and when product is delivered. Rather, customer expectations need to be fully understood, and transportation strategies must be developed to meet these expectations with optimal inventory levels. Transportation strategy and tactics must support Lean inventory strategies.

This will undoubtedly change the transportation methods of the organization. For example, a focus on truckload movements and transportation load building based on economies of scale may not support the customer experience. Products are generally not consumed by the truckload, or even a skid at a time. Rather, small quantities are often preferred to meet consumption needs. Lean transportation means proactively reviewing transportation modes, matching mode to inventory strategies and customer expectations. International trade has added to the complexity of transportation modes and shipments that were once clearly ocean transportation are replaced by air shipments to gain the benefits of speed and dependability. Less than truckload (LTL) shipments are being replaced by frequent ground package shipments or multiple stop milk runs to gain control, visibility and delivery stability. Past paradigms of transportation “givens” must be rethought and reviewed to ensure that inventory and customer requirements are driving transportation methods.

Just in Time

The term *Just in Time (JIT)* is not new, yet its application can be misunderstood. True JIT means requires delivery of inbound and outbound material in exactly the required quantities at exactly the required time. A Lean transportation network must be designed to support Lean delivery requirements. Material arrives in smaller quantities on a more frequent, predictable schedule. Once shipment sizes are reduced and delivery frequency is increased, the shipments need to be leveled over available working time. Lean transportation networks need to successfully support the triple goal of increased delivery frequency, reduction of lot sizes and leveled flow of material. To understand the power of this *triple technique*, examine the following table.

Figure 3: The Power of Delivery Frequency on Space, Inventory and Ordering Lead Time

Frequency Analysis			
1 Truck Load = 1 Week Plant Requirements			
Delivery Frequency (One Part or SKU #)	Monthly	Weekly	Daily
Space Used for Inventory (SQ Feet)	2000	500	100
Average Days on Hand - (Days Inventory)	10	2.5	.5
Lead Time	1 month	1 week	1 day
Percent Improvement from Increased Frequency		Improvement	Over Pervious Period
Space Used for Inventory (SQ Feet)		75%	80%
Average Days on Hand - (Days Inventory)		75%	80%
Lead Time		75%	80%

Implementing the above three Lean techniques strictly from a transportation point of view requires fresh thinking relative to transportation methods. The use of small package delivery, multiple stop milk runs, LTL consolidation and mixed product container building at the point of origin all play a vital role to achieve Lean transportation. The milk run is a specific Lean transportation technique that helps to facilitate small lot sizes, increased delivery frequency and leveled flow. Milk runs are pick-up and delivery routes that deliver goods to manufacturers at fixed times during the production cycle. They typically involve picking up or delivering at multiple suppliers with the same truck. The goal is to deliver small lots in frequent delivery cycles.

The challenge of implementing smaller more frequent shipments is controlling transportation costs. There are tools and techniques to achieve the three Lean goals (frequency, lot size, leveled flow) and even reduce transportation costs in the process. Two of these techniques are *daily transportation variability optimization and transportation event management*.

Transportation Variability Optimization and Event Management

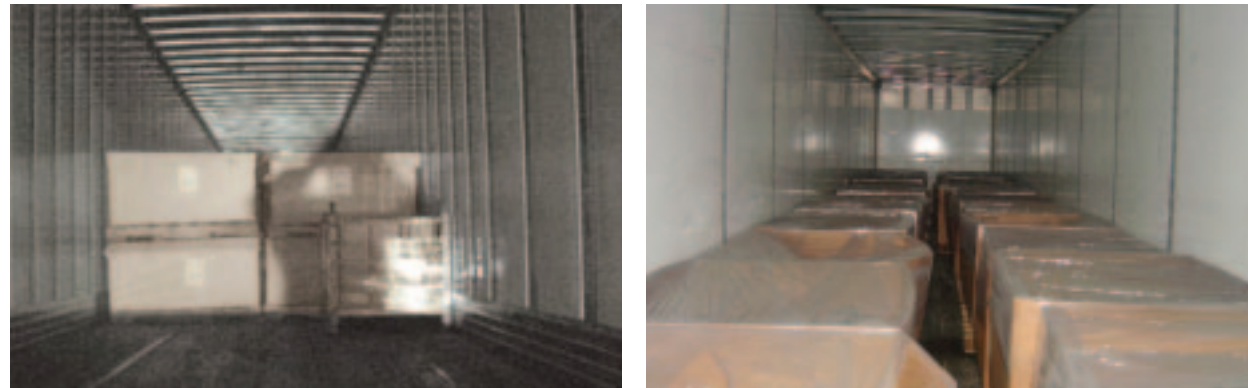
Many organizations approach transportation network planning as a one-time event. They review and plan transportation networks irregularly, perhaps on an annual or bi-annual cycle. Unfortunately, this does not allow for effective transportation cost management. Actual daily transportation requirements seldom reflect what is described by designing transportation networks annually based on historical lane data. Actual transportation requirements tend to have high variation on a daily basis, and therefore opportunities for cost reduction are missed if the transportation network is not being managed on a daily basis. This results in our third Law of Lean Transportation.

Lean Transportation Law # 3 – The Law of Daily Event Management

Transportation cost reduction cannot be realized through infrequent transportation network designs. Real savings will only result from daily management and optimization of transportation requirement variability.

To illustrate this point, consider a supplier or customer where historical data determines optimal shipping is once per week in a truckload quantity. This lane will be set up as a truckload move, where actual requirements may vary from half to a full truck load on any given week. In the absence of daily reviews and real time changes to the network, optimization of transportation costs will not occur. This situation creates an opportunity for multiple stop milk runs, or smaller frequent shipments. This results in transportation savings from a plan using truckload moves from origin to destination were perceived to be the least expensive way to move product. To see how the absorption of variability can produce transportation savings, consider the following examples of two trailer loads:

Figures 4 and 5: Trailers moving under a truckload rate, yet not fully utilized

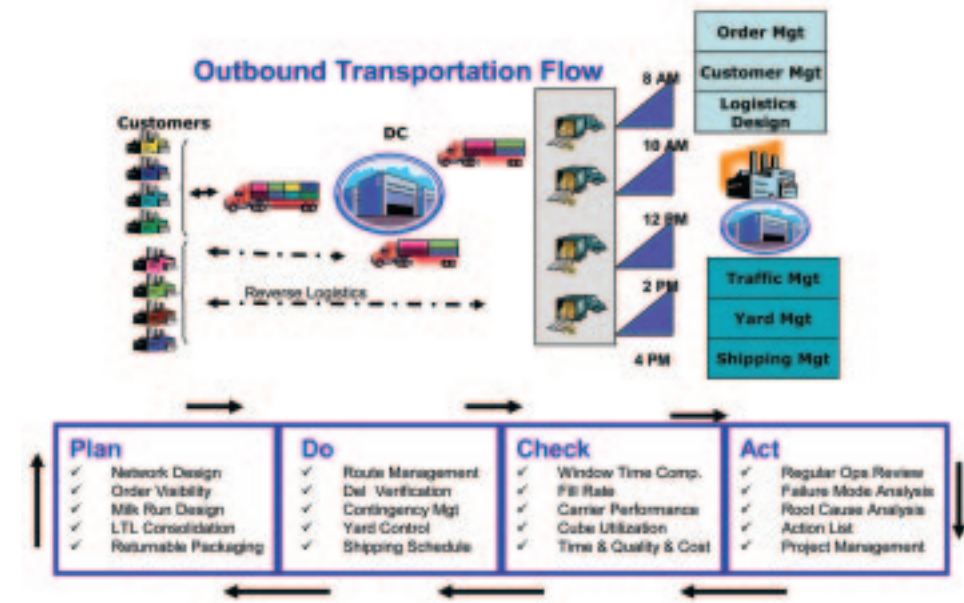


Each of these trailers was routed to a truck load carrier under a truck load rate. This is perceived as the best decision as the weight and volume would have exceeded any reasonable use of an LTL tariff. In other words, the shipments are moved from LTL to Truck Load because the truck load rate is less than the LTL rate for such large shipments. This is very common when LTL shipments begin to exceed 10,000 lbs. However, this is typically where the transportation decision process will stop, believing that transportation costs have been minimized. However, are these in fact full truck loads? Each of these shipments clearly has opportunity for more freight and better utilization of the trailer. Because this is moving under a truck load rate, any incremental material added to the trailer will move at the marginal rate of a stop off charge and out of route miles. Taking advantage of these opportunities and absorbing this variation is where significant transportation savings can occur. Just because product is moving under a truck load rate does mean it is a truck load of material.

Managing transportation requirements on a daily basis requires operational infrastructure and execution capabilities. It also requires a rigorous integration between purchasing, production, customer service and the transportation function. Designing transportation routes on a daily basis requires accurate packaging and parts (or SKU) order level information. In the absence of these data points, the transportation manager is making only high-level mode selection decisions (i.e. Truckload vs. LTL). With correct data and the proper logistics engineering tools, the transportation professional can build linked routes, consolidations and consequently drive waste and cost from the transportation network.

To successfully accomplish daily event management, use of the Plan-Do-Check-Act (PDCA – or Deming Cycle) is extremely critical. PDCA is simple in concept yet often elusive in execution. The PDCA cycle states that on a daily basis we need to have a transportation plan. This plan needs to be executed (Do) effectively whereupon the plan must be checked to the actual condition as compared to the plan. Finally, the Act stage completes the cycle by making small incremental change to close the gap between the plan and actual condition. The goal is to drive towards a flawlessly executed plan with respect to the 8 Rights. In the end, daily PDCA will highlight areas of waste and instability in the transportation network.

Figure 6: Example of PDCA Cycle in Outbound Transportation:



Stability

Stability is vital in order for transportation networks to be planned and monitored effectively. Stability within transportation means that internal processes are reliable, transportation carriers consistently deliver as promised, and problems are quickly resolved without causing major interruptions to the transportation cycle. This is even more critical as transportation systems move from domestic to global networks. Stable systems are predictable, capable and visible. Yet, predictability, capability and visibility are not always evident in our transportation networks. This point helps to define the fourth Law of Lean Transportation.

Lean Transportation Law # 4 – The Law of Transportation Performance

Transportation services are differentiated with distinct and measurable levels of performance.

Not all transportation providers are created equal. Lean requires stability in all systems so that planned operations will be executed efficiently. This stability is realized by working with transportation and logistics providers that meet minimum capability requirements. The service provider must have a rigorous internal approach to process management, advanced use of technology and understanding of continuous improvement. Not all transportation service providers are capable of performing in a lean environment.

For example, prior to Lean implementation, transportation requirements may only dictate that material or product be delivered to the plant or customer by a certain day. Hence, carrier performance may have delivery window flexibility of up to 24 hours. That is, the carrier can deliver the material within a 24 hour period and still be considered on time. However, Lean environments will more accurately define window requirements. What was once a 24 hour delivery window is often reduced down to 2 hours or even a 20 minute planned window time. Moving to a new level of discipline can be very challenging to transportation providers. It is critical to assess carrier performance capabilities and match current and anticipated transportation requirements to carrier capabilities.

Secondly, other operational capabilities such as late pick-up times for packages, which allow maximum production time without compromising next day delivery, may be an important consideration. Other key metrics include damages in transit, responsiveness on issues, accessibility of information about shipments in transit, and reliability of delivery schedules. Making transportation lean does not mean just selecting the lowest price carriers. Confusing price with value can lead to compromised delivery and added costs in the long run. Missed deliveries can result in expedited air freight, shutting down production lines and missed customer orders. Most importantly, the transportation strategy and carrier selection process must match inventory strategy.

Before evaluating and selecting transportation carriers, outline the specific criteria needed to support your objectives. This often results in a lengthy list of qualifications such as delivery service areas covered, transit time commitments, expedited services for critical or emergency shipments, damage rates and responsiveness to claims, technology capabilities, real-time pipeline visibility, transportation costs, invoicing processes, personalized support and responsiveness and technical support. This is just a sampling of services to be evaluated and only increase in length and complexity with global supply chains. Taking the critical first step of determining the needs and impact of transportation to your organization will aid in the evaluation of transportation providers.

Once you understand your transportation requirements, compare the services offered by those transportation carriers that meet your minimum service expectations and carefully make a selection based on total value offered and how well they can support disciplined lean transportation. The bottom line is to carefully evaluate the combination of services, guarantees, reliability, reputation, and price of your transportation providers and then select the carriers that can closely support business objectives. Do not simply focus on transportation objectives based on lowest cost.

Lean Transportation Going Forward

Lean manufacturing and Lean transportation is still in its infancy. Lean awareness is certainly reaching mature stages yet actual execution is lagging behind. How transportation management will compliment Lean is still uncertain in the minds of many logistics practitioners. What is certain however is that significant waste and unnecessary cost does exist in most transportation networks. The key to eliminating waste resides in understanding key Lean principles and the four laws of lean transportation. Most importantly, transportation must support customer and inventory strategies, as opposed to transportation driving inventory and customer strategies. Secondly, a superficial understanding of *Just in Time* must be expanded to enable a paradigm shift away from an unwarranted belief that Lean cannot be implemented while reducing transportation costs. Lastly, comprehensive and frequent reviews of transportation network stability are essential for effective Lean transportation execution.

The future holds many challenges for the transportation professional. Applying the principles of the four laws of Lean Transportation are a means to meet these challenges. Lean principles, techniques and tools will facilitate the development of faster, more flexible and more effective transportation networks. To realize this opportunity, logistics professionals need to challenge current transportation paradigms. This will require tenacity and perseverance while navigating through organizational hierarchies. These required changes may be optional today, but tomorrow will be essential for survival.

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