

Part 1: The Lean Fulfillment Stream

What is a Fulfillment Stream?

In today's world, most products move across many companies and through many departments within each company on their way to the final customer. Because the movement of material is so complex, businesses struggle to understand the progression of their products as they move from their suppliers through their own organization into distribution and on to the customer. Certainly work is done by others somewhere, but managers in each firm and facility are often unaware who does what, where, and when beyond their receiving and shipping docks. And many don't want to think about it.

Businesses have traditionally referred to the progression of materials from suppliers to end customers as the "supply chain." But a chain suggests something heavy and inflexible, prone to kinking and jamming. It's static rather than dynamic. Within a chain it's easy for managers to lose sight of the flow of value from start to finish. Instead they focus on optimizing the one link they control, whether it's a process, a department, or even an entire firm.

To capture the lean concept of smooth flow, we find it helpful to envision a steadily advancing stream of materials and the firms and facilities involved as tributaries joining their efforts to serve the customer. We call this flow of parts and finished products a *fulfillment stream*. It includes all of the activities that move materials and information from suppliers to end customers: planning, sourcing, transporting, manufacturing, inspecting, storing, packing, and consuming, as well as managing the entire process.

Once managers understand that they are involved in a fulfillment stream, we find that they can identify the obstacles preventing the stream from flowing smoothly and swiftly. But because no single manager or firm controls the entire stream, new forms of collaboration are necessary to reduce the total cost of the stream while improving its responsiveness to customer needs. To understand how this can happen we will follow in this workbook the experience of a sample company as it learns to focus on its end-to-end fulfillment stream to make it lean.

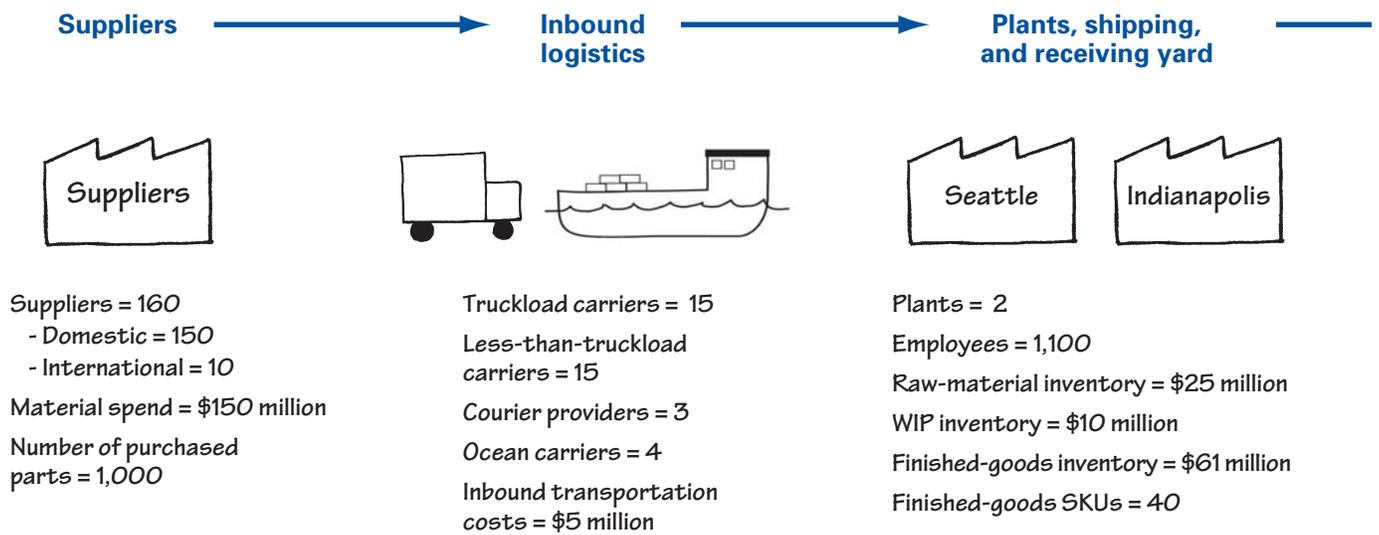
Welcome to ABE Corp.

ABE is a privately owned, mid-sized manufacturer of commercial and residential air conditioning units that are sold through distributors. Even though ABE makes only a moderate range of products, its fulfillment stream from raw materials to customers is lengthy and complex: 160 suppliers ship materials to ABE using 37 different carriers. These materials are assembled in two factories into 40 different completed products. Finished goods are sent to three regional distribution centers via six different carriers. Items are then shipped to 10 national wholesalers using 17 additional carriers.

In recent years, ABE responded to demands from its customers for lower prices, higher quality, and more rapid response by implementing lean manufacturing processes. It improved the stability of its production equipment, created high-performance work cells for product families to replace process villages, and reduced batch sizes. The results of these classic lean production initiatives were dramatic, and ABE was able to maintain profit margins while reducing prices.

But then customers demanded further price reductions, still higher quality, and even more responsiveness. Prices dropped and sales stagnated. Earnings before interest and taxes (EBIT) fell to practically zero. Some of the company's board members urged ABE executives to cut costs by relocating production to lower-wage countries, despite longer distances and lead times.

ABE Operations at a Glance

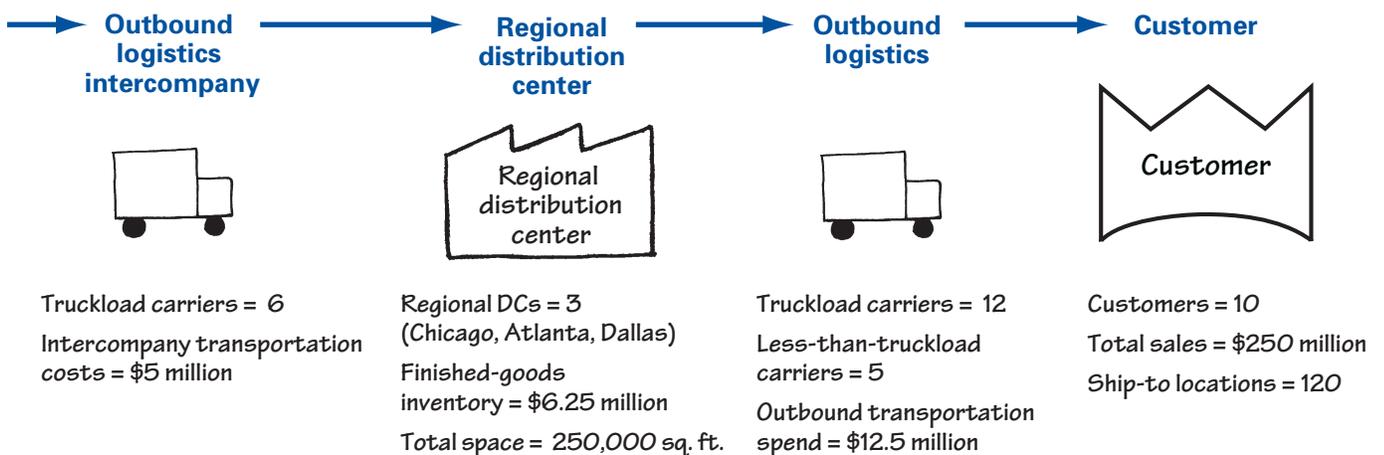


The CFO estimated that to remain competitive, ABE needed to reduce overall costs by \$20 million within two years at constant sales. (ABE’s financial situation is shown in its income statement and balance sheet on page 4).

When ABE’s senior managers met to discuss the situation, they reflected on their process of lean improvements in the preceding years. They had used strategy deployment to prioritize the most important needs of the business and set objectives. They achieved these objectives using A3 analysis and the classic Deming method of plan, do, check, act (PDCA). This allowed creative thinking and problem-solving to flourish in the company, while it maintained and improved process discipline. Given past successes, they easily agreed that this approach should be applied to the CFO’s objective.

The management team felt that they had implemented lean techniques in the factories to such a degree that a further leap in performance equal to the new challenge wasn’t feasible. They also felt that pushing the cost problem back on suppliers—as many of their competitors had done—would provide only temporary relief while jeopardizing the stability of their supply base.

Fortunately, several members of the management team were familiar with the concept of the lean fulfillment stream from experiences supplying other lean firms. They suggested that the most promising way to reduce costs to meet the CFO’s target within two years was to tackle the *total cost of fulfillment*.



ABE Income Statement

Revenue	Current Year	% of Sales
Sales	\$250,000,000	100.0%
<i>Cost of goods sold (COGS)</i>		
Material purchases	\$150,000,000	60.0%
Inbound transportation	\$5,000,000	2.0%
Conversion costs	\$50,000,000	20.0%
<i>Subtotal: COGS</i>	<i>\$205,000,000</i>	
Operating Profit	\$45,000,000	18.0%
<i>Operating expenses</i>		
Product development	\$1,000,000	0.4%
Outbound and intercompany transportation	\$17,500,000	7.0%
Distribution center management	\$5,000,000	2.0%
Selling, general and administrative	\$17,500,000	7.0%
Interest (line of credit)	\$1,500,000	0.6%
<i>Subtotal: Operating expenses</i>	<i>\$42,500,000</i>	<i>17.0%</i>
Earnings before income taxes (EBIT)	\$2,500,000	1.0%

ABE Balance Sheet

Assets	Current
Cash	\$2,000,000
Accounts receivable	\$42,000,000
Raw materials inventory	\$25,000,000
Work-in process inventory	\$10,000,000
Finished-goods inventory	\$61,000,000
Total current assets	\$140,000,000
Fixed assets	\$20,000,000
Total assets	\$160,000,000
Liabilities and shareholders equity	
Accounts payables	\$50,000,000
Short-term debt (line of credit)	\$20,000,000
Total current liabilities	\$70,000,000
Long-term debt	\$30,000,000
Total liabilities	\$100,000,000
Owners equity	\$60,000,000
Total liability and owners equity	\$160,000,000

Total Cost of Fulfillment

The total cost of fulfillment is all of the costs of moving materials from one end of the fulfillment stream to the other. These go far beyond the transportation costs most firms calculate to include the carrying and storage costs of inventory, the cost of material handling equipment and labor, and the management time devoted to gathering all of the information needed to constantly monitor performance. These costs also include all of the transport, inventory, handling, and management costs incurred by customers and suppliers along the fulfillment stream. The senior managers of every firm in the stream would find the total cost surprisingly large once summed.

When the ABE management team committed to reducing the total cost of fulfillment, they realized that this would be an entirely new way of thinking for their suppliers, customers, and ABE's lower-level managers. The latter had gained an ability to see the value stream within their own facilities as a result of previous lean initiatives. But they had never learned to see the entire fulfillment stream and had no idea of the impact of the stream's performance on ABE's financial performance. Their natural reaction was to ask, "What difference does it make what the total cost is? Why can't I focus on controlling costs within my own department?" Suppliers and customers would feel the same way.

In considering how to proceed, ABE's senior managers reflected on their experiences implementing lean techniques in ABE operations. The most successful teams had performed cohesively to achieve collective goals, and took into consideration how their actions affected other teams and departments. These collaborative skills, when set in the context of the financial needs of the whole business, produced the best results. Extending this concept to the lean fulfillment stream would mean looking jointly at the whole stream to achieve maximum value for customers and suppliers at lowest costs while sharing the benefits.

ABE managers realized that for a shift to a lean fulfillment-stream perspective to be successful, all departments and companies involved needed to embrace two core beliefs:

- The customer at the end of the fulfillment stream must define value, and their rate of consumption must set the pace for the entire stream. Doing this requires managing the entire process as a *lean fulfillment stream*.
- Costs must be managed jointly over the long-term, with a clear understanding of how decisions at different points affect the entire fulfillment stream, in order to minimize *the total cost of fulfillment*.

The Fulfillment-Stream Council

ABE's managers decided that for the fulfillment-stream participants to work as an effective team an organizational innovation would be needed. They formed a Fulfillment-Stream Council comprised of a senior leader from each functional area of ABE (Finance, Operations, Purchasing, etc.) plus representatives from suppliers and customers.

ABE appointed internal members to the Fulfillment-Stream Council, and then enlisted its suppliers and customers to do likewise. The members were expected to serve for an extended period (typically two years, with a minimum of one year and a maximum of three) until the transformation to a lean fulfillment stream was in place, meeting quarterly to review progress.

The council would provide vision and leadership for the transformation, but it would not make day-to-day decisions. Instead it would create awareness of benefits of a fulfillment-stream focus, research issues, and challenge business decisions that run counter to fulfillment-stream thinking.

The Fulfillment-Stream Council was responsible for:

- Developing, communicating, and promoting guiding principles for managers along the fulfillment stream.
- Examining business decisions from a total cost of fulfillment perspective.
- Identifying and eliminating barriers to total cost of fulfillment thinking.

The Fulfillment-Stream Council needed to answer the following question: *What is the correct way to run the business in order to minimize total cost?* To answer this question the council needed to agree on some simple guiding principles.

Guiding Principles

Why does fulfillment-stream management require guiding principles? Because a fulfillment stream is lengthy and dynamic and it's impossible for managers to evaluate every action taken with detailed analysis. For example, Toyota has a guiding principle that reducing lead time is the right thing to do. Managers there don't spend time doing analysis every time they try to reduce lead time to prove that this is the correct thing to do. Instead they live by the guiding principle, confirmed over several decades, that reducing lead time eliminates waste, improves quality, and reduces costs.

Eight guiding principles have been shown over many years to be essential for creating lean fulfillment streams:

1. Eliminate all the waste in the fulfillment stream so that only value remains.

Creating flow in a fulfillment stream requires all departments and functions in an organization to work in harmony. Focusing on the fundamental lean principle of eliminating waste so that only value remains helps achieve this harmony.

The seven types of waste in manufacturing are well known: overproduction, waiting, conveyance, processing, inventory, motion, and correction. The seven types of waste for fulfillment streams are:

- **System complexity**—elaborate scheduling systems and managers working around mismatches between the formal schedule and actual needs.
- **Lead time**—too much time from one step to the next.
- **Transport**—excessive conveyance among facilities and companies.
- **Space**—in lieu of processing, space becomes a value factor and excessive space for storing inventories is waste.
- **Inventory**—at any point in the fulfillment stream.
- **Human effort**—fulfillment-stream members working at cross-purposes, which creates rework, confusion, and excessive motion.
- **Packaging**—the wrong types of goods in the wrong quantities resulting in damages, excessive inventories, and corrections downstream.

2. Make customer consumption visible to all members of the fulfillment stream.

If customer consumption is visible across the entire fulfillment stream, then it is much easier for every participant to plan work based on the pull of customer demand.

3. Reduce lead time.

Reducing inbound and outbound logistics lead times will get orders to the customer faster. When a company can reduce lead times to the point where it can exceed lead-time expectations of the customer, it will no longer need to rely on forecasts and can “pull” material throughout the fulfillment stream. End-to-end fulfillment-stream lead times are reduced when overall inventory in the system is reduced.

4. Create level flow.

The ultimate goal is to have goods and information move in a predictable, consistent, and uninterrupted manner based on the actual demand of the customer. This is known as level flow. Level flow reduces variation in processes and tries to spread activities equally over working time. This minimizes the peaks and valleys in movement that create unevenness and overburden, which result in waste.

5. Use pull systems.

Use pull systems when level flow is not possible. A pull system is an inventory-replenishment method (i.e., kanban) in which each downstream activity (customer consumption) signals its need to the next upstream activity. Pull systems reduce wasteful complexity in planning and overproduction that can occur with computer-based software programs such as material resource planning (MRP), and they permit visual control of the flow of materials in the fulfillment stream.

6. Increase velocity and reduce variation.

Velocity is the speed with which information and material move through the fulfillment stream. Meeting customer demand by delivering smaller shipments more frequently increases velocity. This helps to reduce inventories and lead times, which allows you to more easily adjust delivery to meet actual customer consumption.

7. Collaborate and use process discipline.

The collaboration of all participants in a fulfillment stream is necessary to identify problems in the stream, determine root causes, and develop appropriate countermeasures. To be truly effective, this collaboration must be combined with standard improvement processes and regular PDCA.

8. Focus on total cost of fulfillment.

Make decisions that will meet customer expectations at the lowest possible total cost—no matter where they occur in the fulfillment stream. This means eliminating decisions that benefit one part of the stream at the expense of others. This is the real challenge of building a lean fulfillment stream, but it can be achieved when all members share in the operational and financial benefits when waste is eliminated.

River of Waste

Picture your organization (and your fulfillment stream) as a ship navigating down a river. The river represents your business environment—flowing fast with rocks below the water that can puncture the hull. The rocks are problems and wastes (excessive inventories, transport, space, time, packaging, work, and rework) and the water level is inventory throughout the fulfillment stream that hides the rocks.

As you flow down the river, you can do one of three things:

- Navigate around the rocks, relying on managers to constantly change course (firefighting).
- Raise the water level (inventory) to float freely over of the rocks.
- Expose and eliminate the rocks permanently, so the ship can sail safely and with less water (inventory) to its destination (your customers).

Managers often raise inventory levels or keep them unnecessarily high because:

- Supplier deliveries are unreliable, so they add safety stock to gain a sense of security.
- Transportation lead times are erratic, so they add buffer stocks in order to cover variability in lead times.
- Companywide teamwork is lacking, so they build up inventories between departments to protect against the perceived incompetence of departments.
- Communication with customers is lacking, so they hedge against demand uncertainties and raise finished-goods inventory levels.

Inventory only hides these problems. Your company can continue to ignore problems and waste (rocks below the water) and raise the water level (inventory). But eventually excessive inventory will result in a highly inefficient company with uncontrolled internal costs (a boat out of control and thrown over the river's edge by high water). The goal is to gradually create a river that is calm and navigable, removing water slowly to expose rocks without hitting them, and then address each rock (problem) with lean tools to remove them permanently.