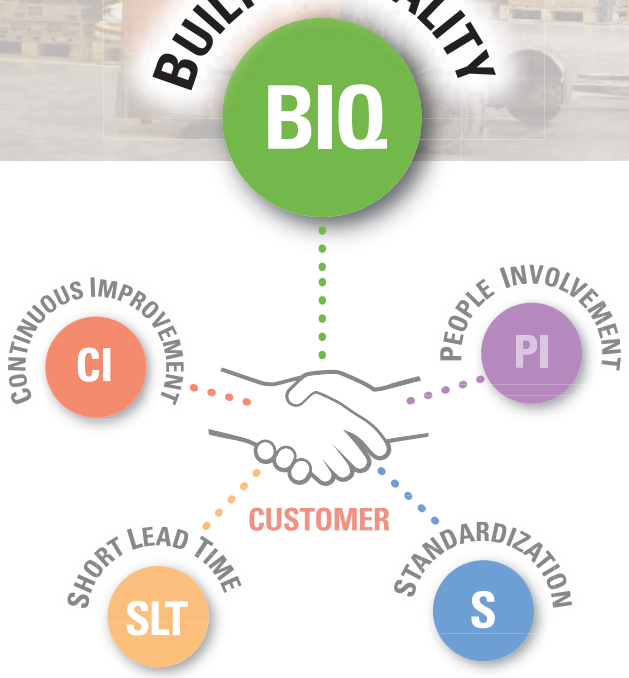
White Paper Series:

Lean Guiding Principles for the Supply Chain
Principle 2: Built-In Quality





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The Lean Advantage

The key to delivering long-term customer value and outstanding business performance, quarter after quarter, year after year, is to implement a lean culture. Lean practices improve quality and productivity by taking cost and waste out of all facets of an operation, from the procurement of raw materials to the shipment of finished goods. In a lean culture, every step in every process must add value for the customer. If it doesn't add value, you strive to eliminate it.

The roots of lean thinking go back to the manufacturing innovations of Henry Ford in the early 20th century. But lean manufacturing really got its start after World War II at Toyota Motor Company, which developed the Toyota Production System (TPS). (1) Much of the TPS is aimed at eliminating *muda*, or waste, which reduces quality and limits profitability. The Toyota team identified seven kinds of waste:

1. **Overproduction** – manufacturing items before they are required
2. **Waiting** – leaving goods in stasis before they are ready for the next process
3. **Transporting** – excessive movement and handling to get goods from one process to the next
4. **Inappropriate processing** – using equipment that is more sophisticated and expensive than needed
5. **Unnecessary inventory** – holding goods that are not flowing through any process
6. **Unnecessary or excess motion** – allowing bending, stretching, walking, etc. that is not strictly needed to do the job and can jeopardize workers' health and safety
7. **Defects** – allowing quality deficiencies that result in rework or scrap (2)

In a lean culture, every step in every process must add value for the customer. If it doesn't add value, you strive to eliminate it.

Business that cultivate a lean culture report significant improvements in their operations.

Although lean thinking started in manufacturing plants, today companies use lean in their finance departments, customer service centers, supply chain operations, research and development organizations and many other areas. Lean thinking also has made an impact on the public and not-for-profit sectors.

Businesses that cultivate a lean culture report significant improvements in their operations. For example, by implementing lean principles at a manufacturing plant in Matamoros, Mexico, Kemet Corporation cut logistics costs by 20 percent, reduced crib inventory by 11 percent and reduced customer complaints from .49 parts per million in FY2005 to .32 parts per million in FY2007. It also increased productivity from 1.1 million pieces per person in FY2005 to 3.4 Million pieces per person in FY2007. (3)

ORGANIZATION	MEASURABLE RESULTS
Kemet Corporation	• Cut logistics costs by 20% • Reduced crib inventory by 11% • Increased productivity from 1.1 to 3.4 million pieces per person
Goodyear Tire	• OSHA incident rate 33% lower than national average • Perfect score on Process & Product Quality Audit • $5 million savings in direct ship warehouse • Zero landfill waste since 2008
Xerox Corporation	• Lean/Six Sigma since 2002 • 300% ROI

In the supply chain arena, a lean culture offers tremendous rewards, but pursuing a lean strategy also requires a significant commitment. Luckily, becoming lean doesn't mean you have to

re-engineer your operation. You can work with a logistics partner to make continuous, incremental gains in quality and efficiency. The right 3PL can jumpstart a company's transformation into a lean organization.

By working with a supply chain partner that has woven lean principles into its very fabric, you gain the benefits of lean culture without incurring the associated up-front costs. Your partner already has made the investments, hired the necessary talent and climbed the learning curve.

At Ryder Supply Chain Solutions, a division of Ryder System Inc., five lean guiding principles govern every activity the company conducts in its own and its customers' warehouses. They are:

1. **People Involvement:** Engaging every employee to root out waste, eliminate problems and make improvements
2. **Built-in Quality:** Striving to prevent mistakes before they happen, and engineering processes to make them "mistake proof"
3. **Standardization:** Documenting best practices and making sure that they are followed
4. **Short Lead Time:** Filling customer orders as promptly as possible
5. **Continuous Improvement:** Understanding that no matter how well a process works today, there is room to make it even better



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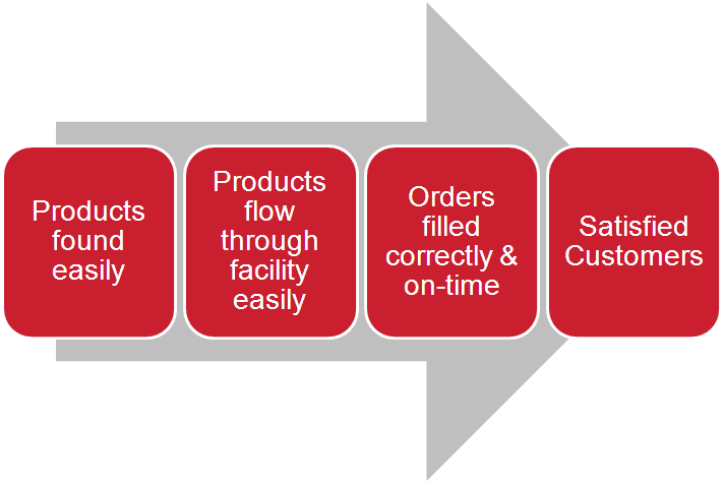
The way to ensure quality is to perform work correctly the first time. That means building quality into every process.

This white paper speaks to Built-in Quality. It is part of a series on the five lean guiding principles, written to provide insight on what it takes to develop a lean culture in a supply chain operation.

Built-in Quality: Get it Right the First Time

High quality in the production and distribution of products improves your bottom line. If employees always know where to find the product they need, goods flow smoothly from one section of the facility to the next. Orders can be filled correctly, completely and on-time, satisfying customer demand. You save time because there's no need to correct mistakes, and you save money because your product is never damaged and retailers don't experience stock-outs. Your efficiency often allows you to take advantage of lower-cost transportation options.

Figure 1: Benefits of Built-In Quality



You can't enjoy these advantages by inspecting for quality after the fact. The way to ensure quality is to perform work correctly the first time. That means building quality into every process.

Mistake-proofing to Eliminate Rework

A company should engineer its supply chain processes with its workers in mind. Any worker should be able to perform processes perfectly to meet the requirements of customers and other stakeholders, such as regulatory agencies. Once the engineering team designs a process, they conduct a failure mode and effects

analysis (FMEA)—a trial run in which someone tries on purpose to "break" the process. By locating weak points where mistakes might occur, the engineers are able to bring the process even closer to perfection.

Next, the design team decides which metrics it will use to determine whether the process is meeting its requirements. Then it documents the standards for performing the work. The team describes the process in text and also creates simple how-to instructions using photographs to illustrate each step for employees.

When a lean business opens a new supply chain facility, it follows the procedures described above to create and document each process that workers in the facility will perform. It then monitors work in the facility for 90 days to make sure that all the processes are working as expected. Once those processes are validated, the facility is certified to be fully operational. Over time, as customers' needs change and the facility starts to handle different products, the engineering team creates, documents and certifies new processes, always aiming to ensure that anyone can perform the work without error.

In-process Controls

Along with designing error-proof tasks, a company can implement safeguards that prevent mistakes while work is in process. Some of these in-process controls may be simple visual reminders. Gemba Research, a lean management consultancy in Mukilteo, Washington, offers an example of an error-proofing system based on text and graphics, designed to keep oversized trucks away from a loading dock. The driver first encounters a height limit warning (Max. Headroom 1.95 m/ 6'6"). He then passes a second sign warning of the height restriction. Finally, the dock door itself is outlined in bright yellow to emphasize the limits on available space. (4) All these elements work together to ensure that only the correct vehicles approach the dock.

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The goal is to further mistake-proof the process by ensuring that the error never has a chance to recur.

Technology also helps. For instance, an employee who is packing a box with ten items might use a scale to check the weight of that box. If each item weighs one pound, the employee cannot accidentally pack the box with eleven items. The ten-pound reading on the scale signals that the packing job is complete. This safeguard ensures that the employee sends only correctly-packed boxes to the next station.

Bar code scanning systems help to maintain quality at many points along the supply chain. In a warehouse, pickers working along a row will scan location codes to ensure that they are in the right aisle. When they start picking, they scan the locations where product is stored to confirm that they have arrived at the right slots. The scanner display then tells the workers how many boxes to pick. As they carry out their instructions, they scan the labels on each box, and the system confirms that they have chosen the right products. These multiple checks help to ensure that pickers fill their orders correctly. Subsequent scans as boxes are loaded onto pallets or into a trailer further reinforce the quality chain.

Understanding Root Causes

Even the most carefully-crafted processes, and the most reliable in-process controls, won't eliminate errors completely. When a mistake slips past the safeguards, you need to dig down to get at the root of the problem. The goal is to further mistake-proof the process by ensuring that the error never has a chance to recur.

Consider a series of orders that include a certain model of graphics cards for a desktop computer. Before these orders are loaded onto a truck, an audit finds that they all contain the wrong card. As soon as the auditor uncovers the mistake, it's time to stop work and walk back through the process to discover what went wrong. It's not enough to replace the wrong cards with the right ones for today's shipment. The team needs to discover the cause of the error and correct it, so the process is performed perfectly in the future.

A tool called the “Five Whys” helps employees step back through the process, discovering, for example, why the pickers picked the wrong card (because the bins were mislabeled) and why the bins were mislabeled (because the database contained an error), and so on.

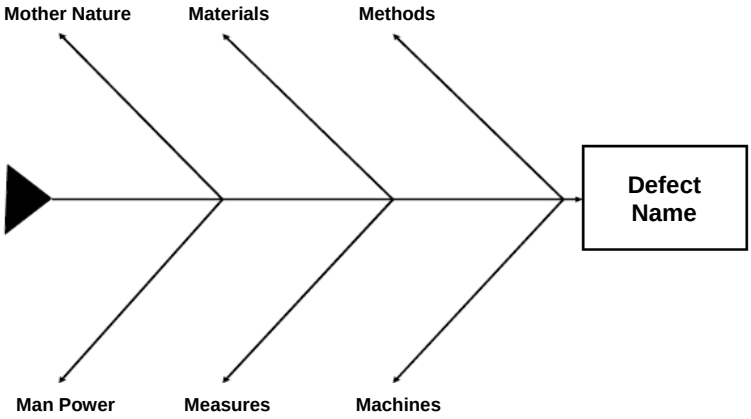
A tool called a fishbone diagram also helps employees analyze the causes of an error by:

a) Drawing a central line labeled with the name of the defect (the fish’s spine)

b) Drawing the “bones” that radiate from the spine to represent categories of problems that might cause the defect

c) Brainstorming about possible causes within each category

Figure 2: Fishbone Diagram



Using tools like these, employee teams and their manager can stop fighting fires—rushing to correct problems after they occur—and concentrate on fire prevention.

Instant Feedback

In the quest for quality, there’s no room for delay. You can’t wait for a Friday meeting to tell a supply chain team that in filling an order for side view mirrors on Monday, it shipped rear view mirrors instead. Workers will be hard-pressed to recall who picked that order, which aisles they worked, what instructions they received and what exactly they did.

Using tools like these, employee teams and their manager can stop fighting fires - rushing to correct problems after they occur - and concentrate on fire prevention.

Part of a team leader or supervisor's responsibility is to help employees do their work according to established standards. When one of those leaders finds that a process is not working up to par, it presents an opportunity for coaching. The leader should take the employee aside immediately, explain what isn't going right and provide instruction on how to do the work better. Leaders should also provide instant feedback when they observe employees performing their work remarkably well.

Get Everyone Involved

In a lean culture, it is every employee's job to perform work according to the documented standards and to take responsibility for quality control. A lean operation empowers employees to spot problems and fix them. But more than that, it empowers them to investigate why the problems occurred in the first place, in order to eliminate those ultimate causes and make sure the mistakes never happen again.

To transform employees into quality experts, it's essential to eliminate fear from the equation.

To transform employees into quality experts, it's essential to eliminate fear from the equation. Employees should feel free to voice concerns, and to stop the flow of work to correct an error. When someone spots a mistake, that should never become an occasion for blame. The goal is not to point fingers, but to set things right so the team can continue to do the best job possible for its customers. Then the team should celebrate the improvement.

Conclusion

A lean culture builds quality into every facet of its operation. With processes designed to make work flow correctly, and tools available to eliminate small problems before they grow large, employees can focus on delivering excellent products and services that increase overall customer satisfaction.

MANAGEMENT TIPS:
ACHIEVING BUILT-IN QUALITY

- Perform work correctly the first time
- Mistake-proof to eliminate rework
- Implement safeguards to prevent mistakes
- Understand the root causes as soon as a mistake occurs
- Provide instant feedback while work is being performed
- Involve all employees in finding improvements in an operation

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Appendix

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