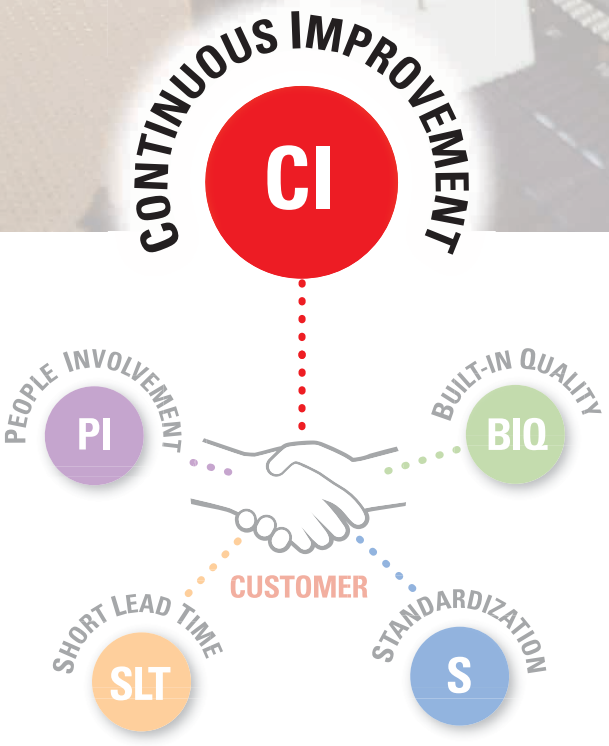
White Paper Series:

Lean Guiding Principles for the Supply Chain
Principle 5: Continuous Improvement





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EXECUTION *is* EVERYTHING

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)

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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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This white paper speaks to Continuous Improvement. 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.

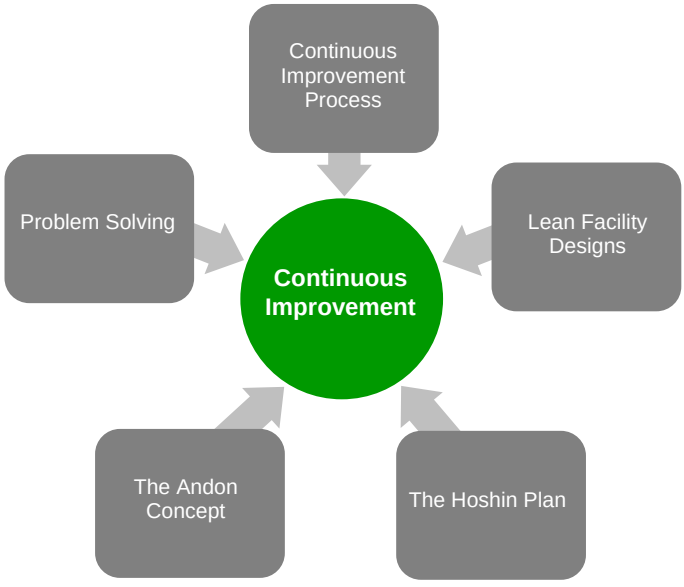
Continuous Improvement: Step by Step

Every day in a lean facility, each employee looks for ways to remove waste and improve quality. That ongoing stream of small gains is called continuous improvement.

Continuous Improvement is based on the idea that it is more effective to make many small gains over time than to try to accomplish massive gains all at once. Not everyone can climb Mount Everest, but nearly anyone can take a single step up a mountain trail. In the same way, anyone can learn to shave one minute from the time it takes to unload a trailer, or to walk from Aisle 3 to Aisle 12 in a warehouse. Continue to make those small improvements, and eventually you will scale the mountain.

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Figure 1: Contributing Elements to Continuous Improvement



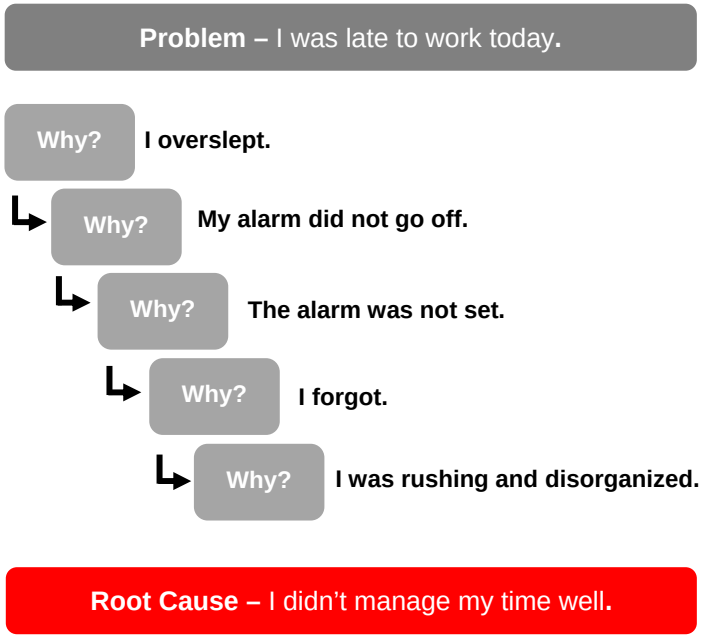
Problem Solving

Problem solving for continuous improvement is a structured practice for identifying a problem, analyzing its root causes and

implementing solutions to resolve the problem in order to keep it from occurring again.

Lean philosophy offers many tools for eliminating problems. One is the problem solving jacket—a booklet that outlines a series of steps required to identify and eliminate a problem and sustain the solution. Another is the "fishbone," a diagram that examines causes and effects. Yet another is the A3 process, a discipline that keeps the discussion of a problem clear and simple enough to diagram it on a single sheet of paper. In addition, a tool called the "Five Whys" helps employees walk backwards through a process until they discover the flaw that created the problem.

Figure 2: Five "Why's?" to identify deeper causes



A company can apply any of these tools toward the same goal—defining the root causes of a problem. The crucial part of this exercise is to state the cause simply, focusing precisely on the process that is not occurring according to standard.

For instance, a team might initially think that the problem it faces is "inventory inaccuracy." But that problem statement is so broad,

When you don't know what is broken, you don't know what to fix. By using lean tools to zero in on the situation, the team can discover where the real problem lies.

it gives no clue about which aspect of the inventory process is functioning incorrectly. When you don't know what is broken, you don't know what to fix. By using lean tools to zero in on the situation, the team discovers where the real problem lies: some employees are not using their data collection terminals correctly to conduct cycle counts, making the inventory counts inaccurate. Once the team discovers the root cause, a supervisor can retrain the employees, ensuring that counts will be accurate in the future.

The Andon Concept

"Andon" is a Japanese term for a lantern. In modern terms, it is a signal used to indicate that something is out of order and needs correction. In industry, an andon often takes the form of a signal light that displays green when work is proceeding as expected, yellow if a problem is starting to emerge and red if a problem needs immediate attention. It may also be a display board that summarizes conditions in multiple work areas. (4)

The andon helps to ensure that employees react to a problem as soon as it emerges, before it has a chance to generate waste or harm the quality of the end product.

As soon as an employee observes that a process is not running the way it's supposed to, that employee is responsible for using the andon to report the problem. In many automotive factories, an employee does this by pulling a signal cord. In other settings, the employee might simply alert a supervisor. The andon helps to ensure that employees react to a problem as soon as it emerges, before it has a chance to generate waste or harm the quality of the end product.

The Continuous Improvement Process

The Continuous Improvement Process (CIP) is woven deeply into the culture of a lean facility. Every employee is trained to identify and root out waste, and devoted to sustaining previous improvements. Employees are ambitious in their efforts to improve performance in order to support customers' needs and help maintain their own job security. They are always suggesting innovative ideas, and even if an idea doesn't work, they are encouraged to keep exploring new ways.

The Japanese term for continuous improvement is *kaizen*; it means "change for the better," or "to break apart and put back together." When employees identify a problem, the process they use to define and implement an improvement is known as a kaizen. Often, the kaizen involves using the Plan, Do, Check, Act (PDCA) process.

FOUR STEPS OF PDCA PROCESS	
PLAN	– Assess the current situation – Determine the change to implement – Define how to test it to make sure it provides the expected benefit
DO	– Implement the change and test it
CHECK	– Analyze the test results to determine how well the change has worked
ACT	– Decide whether to adopt the change, abandon it, or repeat the PDCA cycle with a modified version of the change (5)

When you use the PDCA process to implement an effective change, you also must determine how to sustain that improvement over time. A work team that has made a successful improvement might also share the new technique with another work cell, or with teams at another facility. Meanwhile, teams continue to seek the next incremental improvement to eliminate waste.

Lean Design of Facilities

When designing a distribution center, many people focus on the infrastructure. But when you design a lean facility, the first question to ask is not, "Where should the racks go?" or "How do we position the doors?" Rather, it is "What are we trying to accomplish?"

To design a lean facility, you must start by determining how the work must flow in order to meet customer demand. Then you organize the physical elements to allow the unimpeded flow of the

To design a lean facility, you must start by determining how the work must flow in order to meet customer demand.

right parts to the right place at the right time with the right quality.

Of course, customers' needs will change over time. The workflow will evolve to accommodate different product mixes or fulfillment requirements. To support that evolution, the facility should be as flexible and modular as possible. If you can rearrange racking, move machinery, redesign work groups, reconfigure software and otherwise tailor your resources to your changing workflow, you will always be able to deliver exactly what your customers require.

The Hoshin Plan

The Japanese words *hoshin kanri* mean "direction setting." The Hoshin Plan defines how a company will achieve breakthrough results over the long term, while also making sure that it operates successfully day to day. The Hoshin Plan starts with corporate strategies and then cascades down through the organization, with strategies for individual business units and facilities. The plan also describes the tactics that will be used to fulfill the strategy. (6)

Within a facility, management uses the Hoshin Plan to devise themes that guide employees' search for waste throughout the year. One month, for instance, managers might ask employees to discover ways to improve picking for a particular customer, especially in Aisle 12. Suggestions for improvements in other areas are always welcome, of course. But by providing focused guidance, management helps employees make continuous improvements that are aligned to the goals described in the Hoshin Plan. This helps the facility, in turn, support the company's overall goals.

Conclusion

It takes a special kind of workforce to implement the principle of continuous improvement. In a lean culture, employees arrive at work each day with a desire to eliminate waste and improve quality, making effective use of tools such as the andon concept and the PDCA process to achieve their goals. On a single day, one

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individual's contributions might seem small. But when taken together over time, this ongoing series of incremental improvements creates a powerful force, promoting high performance throughout the facility and producing tremendous employee pride.

MANAGEMENT TIPS:
ACHIEVING CONTINUOUS IMPROVEMENT

- Encourage employees to suggest innovative ideas for improvement and removing waste
- Use lean tools to aid in eliminating problems, such as the Problem Solving Jacket, Fishbone Diagram and A3's
- Use andon signals that summarize conditions in multiple work areas so employees react to problems as soon as they emerge
- Use the PDCA Process – Plan, Do, Check, Act – to define and implement improvements
- Design a facility that is flexible and modular so that it can be organized and rearranged to always meet customer demand
- Use the Hoshin Plan to devise themes that guide employees' search for waste throughout the year

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Appendix

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