



Continuous Improvement Toolkit: 10 Critical Lean Tools



Introduction to Lean Tools

“Lean” focuses on maximizing customer value by removing waste and eliminating defects. Lean is a mindset that everyone in an organization should be able to spot waste and bring it up to management to be addressed.

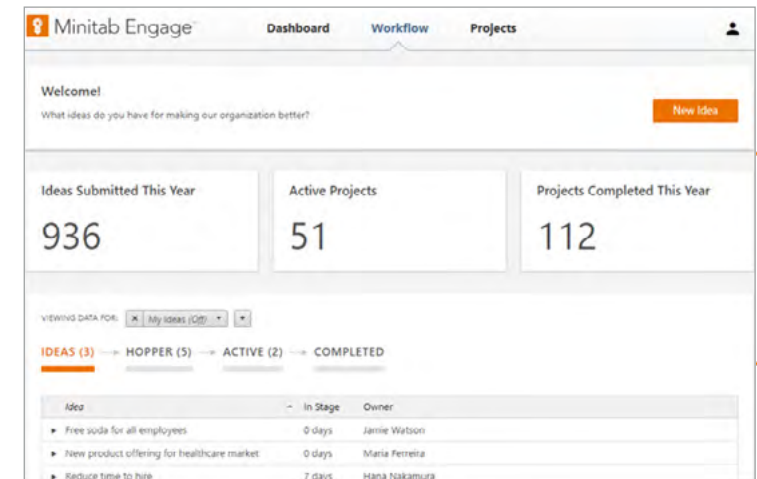
Although Lean uses data, its tools are not as analytical or data-rich as those used in Six Sigma in manufacturing. For example, Lean tools are more about understanding the process, looking for waste, preventing mistakes, and documenting what you did. Lean seeks to make it easy to do things the right way and hard to do things the wrong way.

There are many examples of the positive impact of Lean implementation in just about every industry and type of organization. Dramatic cost savings, lead time and inventory reductions, as well as many other improvements have been cited by businesses around the world. Familiarizing yourself with Lean tools is a great way to get started in implementing Lean.

How can you use and apply these Lean tools yourself? One approach is to use Minitab Engage, the only solution designed to start, track, manage, and share innovation and improvement initiatives from idea generation through execution. Engage combines a desktop toolkit of tools for executing your projects, with a web-based dashboard for visualizing benefits and project information. Using a workflow, the software will manage the flow of ideas to projects to completion, effortlessly streamlining phase reviews and approvals.

In this toolkit, we briefly explain the key Lean tools used in process improvement, what they do, and why they're important. The tools we selected for this toolkit are straightforward, but they are incredibly powerful when it comes to identifying and eliminating waste and defects.

Let's explore the ten critical Lean tools in process improvement.



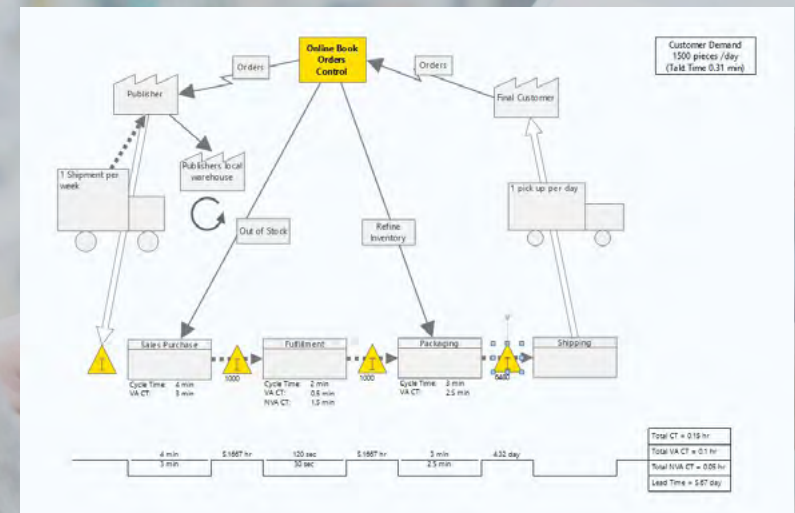
Lean Tool #1. Value Stream Map

Why it matters: Value stream mapping is a cornerstone of the Lean process improvement methodology that helps organizations understand where value is created or lost. Value is defined by the customer based on their perception of the usefulness and necessity of a product or service. In other words, value is what the customer is buying.

How to use it: A value stream map is a collection of all the activities, both value-added and non-value added, that take a product or service from its beginning through to the customer. You can include material and information flow, operating parameters, or defect rates, lead times, and so on. This enables you to analyze the current state and design a future state for the end-to-end activities that generate your product or service to meet customer needs.

Example

Here is a value stream map that outlines a book publishing shipment process.



Lean Tool #2. Gemba Walk Interview Sheet

In manufacturing, the idea of reviewing the actual work process in person is called the Gemba Walk. “Gemba” is Japanese for “the real place,” meaning where the real work happens. Gemba Walks allow leaders and managers to observe the process in real-life, engage with their team and operators, gain knowledge about the process, and explore ideas for continuous improvement.

Why it matters: The overall purpose of a Gemba Walk is to observe, understand, and ultimately improve a process. In a way, a Gemba Walk can be viewed as a “reality check”. An organization may have an idea of how a process may work, or how it should work. But a Gemba Walk helps an organization confront the reality on the ground, along with any surface issues that might not have previously been identified.

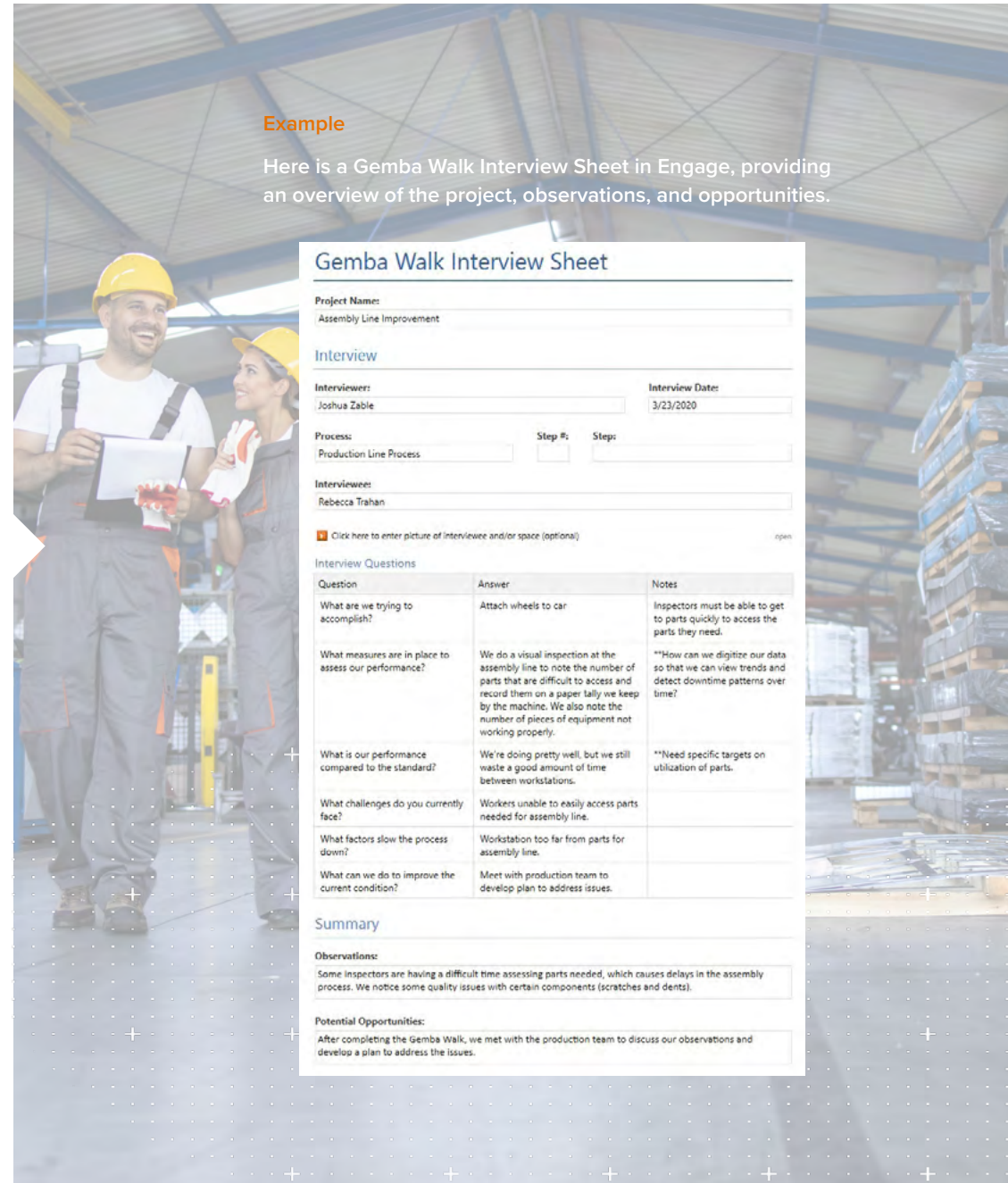
How to use it: Those participating in Gemba Walks would walk the factory floor, observe the process, and ask questions.

To implement a Gemba Walk, you’ll use the Gemba Walk Interview Sheet. It consists of a series of questions, data points, and observations that can be captured from a Gemba Walk. The interview sheet provides a framework for continuous interaction and consistent feedback.

The Gemba Walk Interview Sheet answers the following questions.

- What are the steps of the current process?
- What are we trying to accomplish?
- Where are the inefficiencies?
- Which steps add value? Which steps add waste?

Wherever there’s a process, a Gemba Walk is beneficial. This tool can be applied to any process, no matter the industry. To ensure accuracy, it can also be used along with a process map. If done well, a Gemba Walk encourages openness, collaboration, and teamwork across all levels of the organization.



Example

Here is a Gemba Walk Interview Sheet in Engage, providing an overview of the project, observations, and opportunities.

Gemba Walk Interview Sheet

Project Name:
Assembly Line Improvement

Interview

Interviewer: Joshua Zable **Interview Date:** 3/23/2020

Process: Production Line Process **Step #:** **Steps:**

Interviewees: Rebecca Trahan

Click here to enter picture of interviewee and/or space (optional)

Question	Answer	Notes
What are we trying to accomplish?	Attach wheels to car	Inspectors must be able to get to parts quickly to access the parts they need.
What measures are in place to assess our performance?	We do a visual inspection at the assembly line to note the number of parts that are difficult to access and record them on a paper tally we keep by the machine. We also note the number of pieces of equipment not working properly.	**How can we digitize our data so that we can view trends and detect downtime patterns over time?
What is our performance compared to the standard?	We're doing pretty well, but we still waste a good amount of time between workstations.	**Need specific targets on utilization of parts.
What challenges do you currently face?	Workers unable to easily access parts needed for assembly line.	
What factors slow the process down?	Workstation too far from parts for assembly line.	
What can we do to improve the current condition?	Meet with production team to develop plan to address issues.	

Summary

Observations:
Some inspectors are having a difficult time assessing parts needed, which causes delays in the assembly process. We notice some quality issues with certain components (scratches and dents).

Potential Opportunities:
After completing the Gemba Walk, we met with the production team to discuss our observations and develop a plan to address the issues.

Lean Tool #3.

A3

The A3 is a structured template for solving problems and determining root causes. It is an effective tool for organizations seeking to improve their process and solve problems efficiently.

Why it matters: A3 is an important methodology for problem-solving and continuous improvement. Its simple, structured approach, visual communication, and encouraged cross-team collaboration make it an effective Lean tool. The form is traditionally limited to the size of a single sheet of paper, so you can see the whole problem, its root cause, and a solution on a single page.

The A3 is important for several reasons:

- Focuses on problem-solving to identify the root cause of the problem.
- Helps teams stay organized and aligned.
- Provides a visual representation of the problem, the root cause, and the solutions.
- Proposes improvements, reporting, and coaching across the organization.

How to use it: Use the A3 form to tell the story of a problem, its analysis, and its solution.

The A3 answers the following questions.

- What is the problem?
- What is the root cause of the problem?
- What are potential solutions to the problem?

A3 helps the entire organization communicate the problem and the solution in a clear and concise manner.

Example

Here is the A3 tool in Engage, outlining a pizza making process.

A3

Project: Pizza Improvement Process		Value Stream:		Champion: JP Marsh		Team: Joshua Zable Rebecca Trahan David Peratta											
Revision:		Date: 3/21/2022		Process Owner: Bill Rand		Mentor/Coach: Christene Long											
Problem Statement: Pizza arrive late, cold, burnt, or with incorrect toppings.				Improvement Metrics:													
				Metric:		Baseline:	Target:										
				Pizza or service is unacceptable to the customer		10	1										
Root Cause Analysis:				Implementation Plan:													
				<table border="1"> <thead> <tr> <th>Task</th> <th>Type</th> <th>Assigned To</th> <th>Start Date</th> <th>Due Date</th> </tr> </thead> <tbody> <tr> <td>Task</td> <td>Just-Do-It</td> <td>Bill Rand</td> <td>3/25/2022</td> <td>4/8/2022</td> </tr> </tbody> </table>				Task	Type	Assigned To	Start Date	Due Date	Task	Just-Do-It	Bill Rand	3/25/2022	4/8/2022
Task	Type	Assigned To	Start Date	Due Date													
Task	Just-Do-It	Bill Rand	3/25/2022	4/8/2022													
Current State:				Future State:													

Example

Here is the 5S Audit tool in Minitab Engage which provides a consistent framework for sustaining the 5S gains. This tool also feeds the online dashboard reporting to ensure everyone's progress is clear, visible and shareable.

5S Audit

Project Name:
Buy More Books

Prepared By: _____ **Prepared Date:** _____

Area:

0	1	2	3	4
Very Unacceptable	Unacceptable	Average	Good	Perfect

1S Sort

No.	Checking Item	Evaluation Criteria	Score
1	Parts and Materials	Are all stock items and work in progress necessary?	0 1 2 3 4
2	Machines and Equipment	Are all machine and pieces of equipment used regularly?	0 1 2 3 4
3	Jigs, Tools and Molds	Are all jigs, tools, molds, cutting tools, and fittings used regularly?	0 1 2 3 4
4	Visual Control	Can all unnecessary items be distinguished at a glance?	0 1 2 3 4
5	Documentation	Are all obsolete documents purged routinely?	0 1 2 3 4

Summary

Subtotal	0
Maximum Possible	20
Percent	0.0 %

2S Set in Order

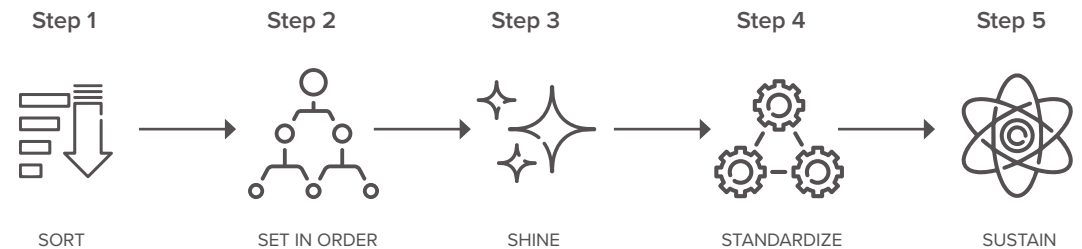
No.	Checking Item	Evaluation Criteria	Score
6	Location Indicators	Are shelves and storage areas marked with location indicators?	0 1 2 3 4
7	Shelves marked by the which	Are shelves marked by the which	0 1 2 3 4

Lean Tool #4. 5S Audit: Sort, Set in Order, Shine, Standardize and Sustain

Why it matters: A clean, well-organized workplace improves efficiency and eliminates waste. With a method to organize, audit and maintain your workplaces and systems, you encourage productivity and ensure consistency across the business.

How to use it: 5S is a team-based set of tools that systematically and methodically organize the workplace. It comprises five steps to follow: Sort, Set in Order, Shine, Standardize and Sustain. With the first step, Sort, you remove the unwanted and unnecessary. With Set in Order, you arrange items to be easy to use. With Shine, you clean and inspect the workplace regularly. With Standardize, you establish procedures and schedules to ensure the first 3 steps are consistently performed across your organization.

The fifth and final step, Sustain, is one of the hardest steps to accomplish. It's akin to losing the weight and keeping it off. Sustaining requires maintaining the gains of process improvements on a regular basis. Without it, old habits resurface, and the workplace falls into disarray. To support this, it's important that the benefits are visible and shared so everyone is encouraged to keep it up.



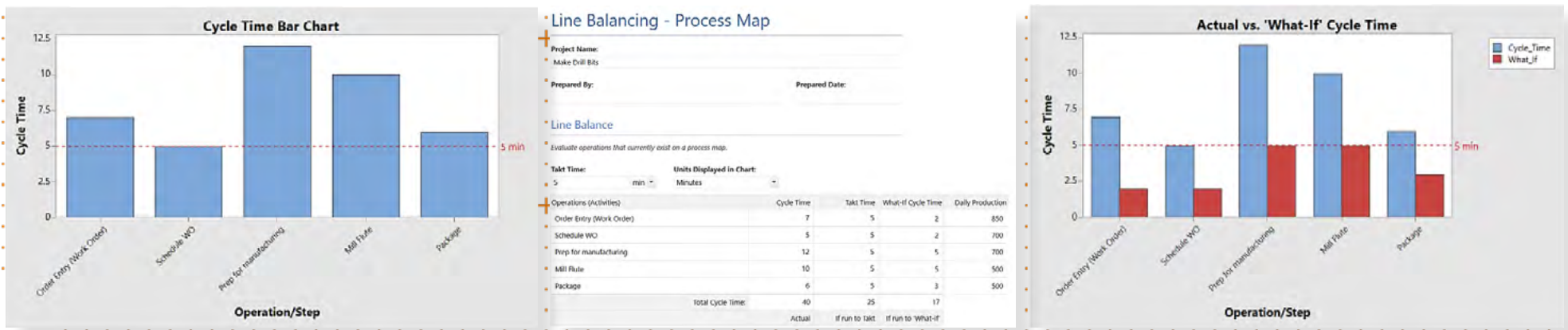
Lean Tool #5. Line Balancing

Why it matters: All steps in a process should meet the rate of customer demand. When process steps are not balanced, some resources may be idle while others are overworked. The solution is to eliminate non-value-added tasks in a process, combine tasks and closely balance the remaining steps.

How to use it: Line balancing is a technique for achieving these goals, through “equalizing” a set of process steps to smooth the time required to accomplish them. To highlight the waste of waiting, you compare the time required to meet customer demand, known as ‘takt time’, with the cycle time for multiple operations on a process map or value stream map. This analysis highlights the discrepancies and is useful for you to balance either a work cell or a sequential series of process steps.

Example

Here Engage compares a ‘What If’ cycle time with the current cycle time to visualize the improvements.



Lean Tool #6. Kaizen Event

Why it matters: Kaizen is a method for accelerating the pace of process improvement projects. While originally developed for manufacturing, Kaizen is used extensively in a variety of industries and is a valuable technique for the process improvement practitioner. Kaizen is most effective when used to eliminate waste and non-value-added activities.

How to use it: Kaizen is a focused 3-5 day dedicated event to drive process improvements. Project objectives are well-defined and appropriately scoped going in to the Kaizen event. Employees are pulled from their daily duties to participate. Typically, there is a mid-week review and a final presentation. Solutions are implemented immediately.

Example

To help leaders plan and implement a Kaizen event, Engage provides a Roadmap to aid effective analysis, implementation, and enable reporting of results.

Project Today

Project Name:
Improve Drill Bit Manufacturing Process

Project Leader: Bonnie Stone **Sponsor:** **Methodology:** Kaizen Event

Project Status & Progress

Status: In Progress **Start Date:** 9/11/2017 **Due Date:** 9/15/2017

Project Health: Green ●

Current Phase

Current Phase: Kaizen - Day 3 P 1 2 3 4 5 ⌂

Ready for Phase Gate Review: Yes Ready

Phase Data

Order	Phase Name	Start Date	Phase Gate Review Date	Duration (days)
1	Preparation Phase	8/28/2017	9/1/2017	4
2	Day 1 - Measure	9/11/2017	9/12/2017	1
3	Day 2 - Data and Analyze	9/12/2017	9/13/2017	1
4	Day 3 - Analyze and Implement	9/13/2017	9/14/2017	1
5	Day 4 - Finish Implementation	9/14/2017	9/15/2017	1
6	Day 5 - Pilot and Present	9/15/2017	9/18/2017	3
7	Event Closure and Follow Up	9/22/2017	9/29/2017	7

Lean Tool #7. Work Element Time Study

Work Element Time Study is a tool used to analyze and improve a process. It consists of taking a task, breaking it into sections, and measuring the time it takes to complete each section. Data gathered and analyzed during the process can spot inefficiencies, boost productivity, and eliminate waste.

Why it matters: Work Element Time Study can help manufacturers understand the time it takes to complete a task or project to make accurate estimates for future projects and improvements.

How to use it: Use the Work Element Time Study form to document the time elements of a process by operation.

- Identify the task or project you want to analyze.
- Break the task down into smaller steps.
- Enter the operation steps and record the time data for each step. If a time study is necessary, ensure that the process is running normally.
- To calculate the average time for multiple measurements, add a column for each additional measurement.
- Compare the estimated time to the actual time spent.

By using the Work Time Element Study, you can gain a better understanding of the time required to complete a task or project and make more accurate estimates for future work.

Example

Here is the Work Element Time Study tool, providing a clear view of a food safety process.

Work Element Time Study

Project Name:
Food Safety Process

Prepared By: Rebecca Irahan **Prepared Date:** 3/20/2023

Process Details

Process:
The overall process is not efficient and we are losing orders because we cannot meet our guaranteed ship date.

Typical Process Time: **Typical People Count:** **Takt Time:** sec

Work Element Table

Work Element	Work Element Description	Time	Time	Time	Avg
Bread	Select and open bread roll	33.0 sec	32.0 sec	35.0 sec	33.3 sec
Cond	Apply condiments	52.0 sec	55.0 sec	47.0 sec	51.3 sec
Meat	Add meat	82.0 sec	93.0 sec	49.0 sec	74.7 sec
Veg	Add vegetables as selected	39.0 sec	52.0 sec	53.0 sec	48.0 sec
Pkg	Wrap and package sandwich	62.0 sec	67.0 sec	69.0 sec	66.0 sec
Total:		268.0 sec	299.0 sec	253.0 sec	

Summary

Objective:
Improve overall process to make it more efficient to meet ship date for customers.

Conclusion:
Right now the overall process can take up to 299 seconds, which is unacceptable.

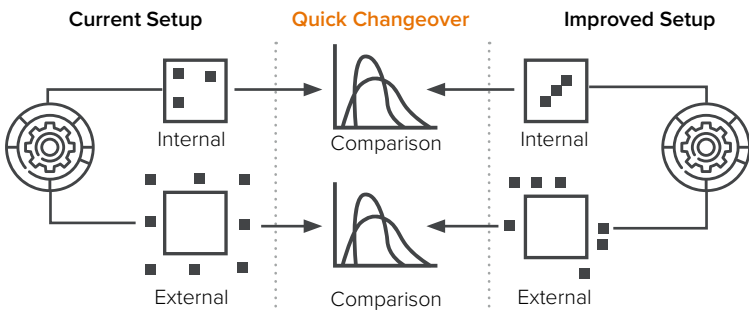
Lean Tool #8. Quick Changeover (QCO-SMED)

Why it matters: Substantial Lean gains can be achieved when you reduce the time, skill or materials needed for setup, particularly for workflows or transactions that require a quick reset. Opportunities exist in every sector: whether changing tools in manufacturing, preparing operating rooms or hospital beds, or loading/unloading airline passengers, for example.

How to use it: Quick Changeover is a tool to analyze your current processes and compare them with future states. It involves identifying the process steps and assigning them into one of two categories:

- *Internal* - must be done while the process is stopped
- *External* - can be done while the process is running, either before or after performing the setup

This enables you to compare the internal and external components of process changeover, or setup, for both current and improved states. By implementing Quick Changeover, organizations can reduce internal setup time. This reduces the amount of non-productive process time and enables more setups, smaller run batches, and improved flow. The secondary benefit is to free up labor, through reduced total setup time.



Quick Changeover (QCO-SMED)		
Project Name: Make Drill Bits		
Prepared By: Bonnie Stone	Prepared Date: 9/19/2017	
Workstation Details		
Workstation or Equipment: CNC grinding wheels		
Referenced Workstation Instructions or Procedures: Grinding wheel replacement		
Changeover Information		
Number of Distinct Parts Using the Workstation: 45		
Number of Current Changeovers: 10	Frequency: Per Day	
Run Size		
Minimum	Average	Maximum
1	250	1000
Run Length		
Minimum	Average	Maximum
5	82	18

Quick Changeover Analysis			
Initial State			
Work Element	Activity Description	Elapsed Time	Type
1	Stop and safe CNC	30 sec	Internal
2	Read WO and select grinding wheels	3 min	Internal
3	Remove grinding wheels	4 min	Internal
4	Replace grinding wheels	6 min	Internal
5	Adjust grinding wheels	8 min	Internal
6	Practice run	5 min	Internal
7	Inspect trial drill bit	45 sec	Internal
8	Adjust grinding wheels if needed	8 min	Internal
9	Restart CNC	20 sec	Internal
Total Time:		35.6 min	
Baseline Internal Setup Times:		35.6 min	
Baseline External Setup Times:		0.0 sec	

Example

Here is a comparison of the initial state and an improved state. The Improved State shows a 24-minute reduction in internal setup.

Improved State			
Work Element	Activity Description	Elapsed Time	Type
1	Read WO and select grinding wheels	3 min	External
2	Stop and safe CNC	30 sec	Internal
3	Remove grinding wheels	2 min	Internal
4	Replace grinding wheels	3 min	Internal
5	Adjust grinding wheels	2 min	Internal
6	Practice run	3 min	Internal
7	Inspect trial drill bit	45 sec	Internal
8	Adjust grinding wheels if needed	2 sec	Internal
9	Restart CNC	20 sec	Internal
Total Time:		14.6 min	
Improved Internal Setup Times:		11.6 min	
Improved External Setup Times:		3.0 min	
Net Reduction of Setup Time			
Total Setup Time Reduction		21 min	
Total Internal Setup Time Reduction		24 min	

Lean Tool #9. Standard Work Combination Chart

Why it matters: For each element of work, the time used by a machine or operator should follow the best current practice. By documenting a detailed definition of the most effective and reliable methods and sequences for processes, you create a powerful Lean tool. This definition of “standard work” clarifies the process, ensures consistency, expedites employee training, and provides a baseline for further improvement.

How to use it: After documenting the elements of work, categorize them as manual (shown in orange), machine (shown in blue), or walk (shown in green) to show the work visually. Aided by graphs and color coding, you can quickly pinpoint wasteful activities and waiting.

Example

Here in Engage, a Standard Work Combination Chart graphically displays the cumulative time as manual (operator controlled) time, machine time and walk time. Looking at the combined data helps to identify excesses within a process.

Standard Work Combination Chart

Project Name:
Make Drill Bits

Prepared By: Bonnie Stone **Prepared Date:** 9/19/2017

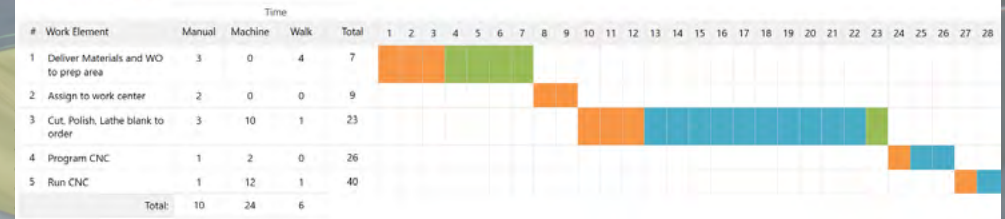
Summary

Process Step:
Prep

Takt Time: 10 **Total Accumulated Time:** 40 **Units of Time:** Minutes

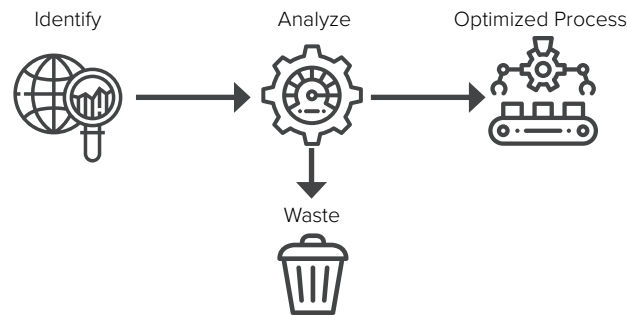
Conclusion:
Opportunity to perform a Waste Analysis on this process to eliminate NVA.

Work Combination Chart



Lean Tool #10. Waste Analysis by Operation

Why it matters: In Lean, waste is anything in a process that is unnecessary and does not add value from the customer’s perspective. The purpose of Lean is to identify, analyze, and eliminate all sources of waste, such as defects or excessive inventory.



How to use it: Performing a Waste Analysis by Operation documents the types of waste at each process step, to quantify and color-code the degree of the waste. “No observed” waste is a zero or a blank, while a 9 indicates “total waste”, i.e. no value added. The Waste Analysis activity is most effective when performed by multiple observers, both within and outside of the process being examined.

Example

Here is the Waste Analysis by Operation tool in Engage, providing a clear view of areas to address.

Waste Analysis by Operation

Project Name: Make Drill Bits

Prepared By: Bonnie Stone **Prepared Date:** 9/19/2017

Operations that exist on a process map

Open/close table

Operation/Process Step	WASTES							Comments		
	Overproduction	Waiting	Transportation	Overprocessing	Excess Inventory	Unnecessary Movement	Defects		Waste of Human Capital	
Order Entry (Work Order)		4					3	6	2	Excessive order entry mistakes
Schedule WO		5	6				4			WO and raw materials are incorrectly delivered
Prep for manufacturing		6	4		1					Excessive WIP
Mill Flute		2					5			Excessive rework
Package		3	2						7	Machinist packages

Start using these critical Lean Tools now

Engage enables you to streamline and standardize your Continuous Improvement (CI) program. It is the only solution to blend customizable CI management tools, centralized data retention with real-time dashboarding.

Whether you want to enhance process improvement through increased visibility, oversight, and governance, or optimize products and services through the use of best-in-class tools, Engage provides everything you need to make your continuous improvement projects more visible, effective, and profitable.

