

## Online Student Guide

### A3 Problem Solving



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## Learning Objectives

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In this module, we will:

- Show the importance of observation for Lean process improvement.
- Describe the A3 Report as a problem-solving and communication tool.
- Demonstrate how the Plan-Do-Check-Act, or PDCA, cycle is an integral part of A3.
- And explain the concept of Going to Gemba.
- We will also walk through the steps for completing an A3 Report, including key questions to ask at each stage.
- And discuss what makes a good A3.

## Introduction

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### Lean is Seeing



Too often, when an improvement team is faced with analysis and problem solving in a complex process, it will turn to time-consuming reports that are full of technical details, business terminology, and data analysis. A more efficient approach, however, is a powerful and critical Lean tool called Visual Management.

In a Lean process, the manager's job is to see: to see the process, see progress, and see problems. Visual Management makes this possible. A good Visual Management system enables management to see opportunities for learning and improvement that are aligned with organizational goals.

Next, we will explain how to apply Visual Management to the problem-solving process.

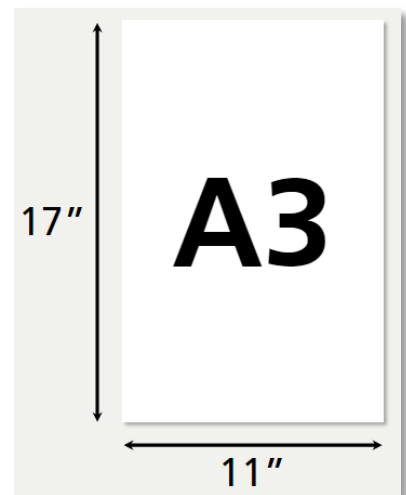
### What is A3?

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The A3 Report is a single page presentation of a problem-solving activity. It takes its name from the European designation for a sheet of paper that is approximately 11 by 17 inches in size. The principle behind A3 is that everything you need to know about an issue or problem can be captured on a single sheet of paper.

The A3 Report was developed by Toyota to teach people to communicate with as few words as possible, using visual aids. This means that information and data about a problem must include only the critical and visual information needed to communicate, collaborate, and reach consensus about the process and problem being observed.

In other words, everything the team needs to know about the process is contained on this one sheet of paper, which serves as a key communication tool throughout the project.



## The A3 Format

Although A3 forms can vary, they contain some basic elements. This is a typical A3 format.

Title: _____ Owner: _____ Date: _____ Mentor: _____	
<b>BACKGROUND</b> _____ <b>CURRENT CONDITION</b> _____ <b>GOAL</b> _____ <b>ROOT CAUSE ANALYSIS</b> _____	<b>COUNTERMEASURES</b> _____ <b>PLAN/CONFIRMATION</b> _____ <b>FOLLOW-UP</b> _____

### PDCA Cycle

A problem-solving process called Plan-Do-Check-Act, or PDCA, is embedded in the A3 Report. Developed by W. Edwards Deming, it is sometimes referred to as the Deming Cycle.

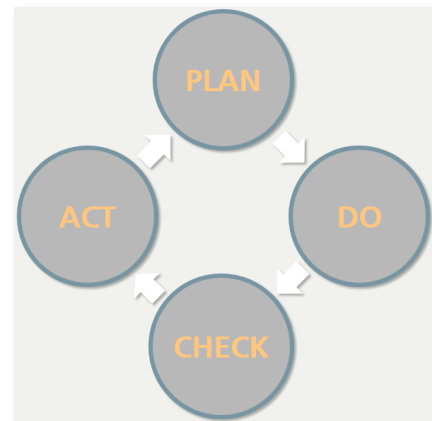
Let's take a look at the four phases of the process: Plan, Do, Check, and Act.

The team begins with the Plan phase. During this phase, the team identifies and analyzes the opportunity or problem, and plans a change.

Next, the team moves into the Do phase, which is to test the change. Here, the team will carry out a small-scale study, and then develop and test a potential solution.

In the Check phase, the team reviews the test, analyzes the results, and identifies what has been learned. During this phase, the team measures the effectiveness of the solution and determines whether it can be improved in any way.

In the fourth and final phase, Act, the team implements the improved solution in full. If the change did not work, it will go through the cycle again, with a different plan. If successful, the team will incorporate

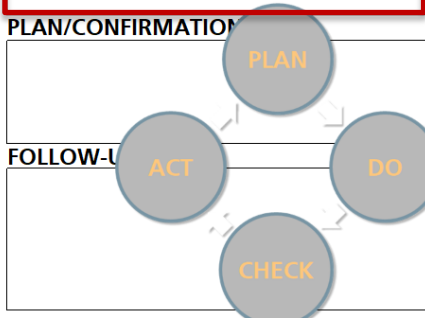


what it learned from the test into wider changes. It will also use the lessons learned to plan new improvements, thus beginning the cycle again.

## PDCA and the A3 Report

As you can see here, the A3 format includes the PDCA process.

The A3 is designed to ensure the team has a thorough understanding of the current situation before it moves into planning. Before the team can start the PDCA process to implement changes, it must first define the problem, identify root causes, and determine countermeasures.

Title: _____	<b>COUNTERMEASURES</b>
Owner: _____ Date: _____	
Mentor: _____	
<b>BACKGROUND</b>	
<b>CURRENT CONDITION</b>	
<b>GOAL</b>	
<b>ROOT CAUSE ANALYSIS</b>	
	<b>PLAN/CONFIRMATION</b> 
	<b>FOLLOW-UP</b> 

## Going to Gemba

Now that you understand the basics of the A3 form and the PDCA cycle, let's take a closer look at the problem solving process.

In any successful problem solving process, it is critical that the team define and solve the right problem. One of the most serious errors a team can make is thinking it knows something concrete about a situation without having direct, precise knowledge. In our business culture, there is often a sense of urgency to solve problems quickly. This leads to hasty decisions and solutions that don't fix the root causes.

In problem-solving, an important step is for the team to observe the actual process. This brings us to an important philosophy called "going to Gemba." Gemba, a Japanese term for "actual place," describes the place where the value-creating work happens. It is more than just the shop floor; it is the setting in any area or organization where individuals are creating value for the customer.

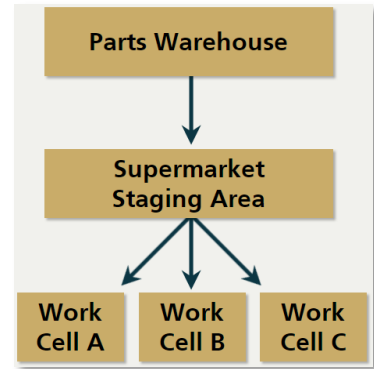


Improvement happens only when the team directly observes the process, and the current conditions, where the work is done. This can't be accomplished from a desk or conference room; it requires actual observation. To "go to Gemba" is to discover the truth.

A3 is not just a form for a team to fill out. Indeed, Lean and A3 thinking are about learning to see the process. Next, let's look at an example of a problem solving process to illustrate how the A3 thinking process is used.

## Our Process

In this example, the process consists of three work cells that assemble an electronic product. The product consists of several small components that are assembled to different configurations based on customer demand. The Parts Warehouse gathers the components for the product into kits, that are delivered to the Supermarket Staging Area. The various work cells then pull the kits as needed.



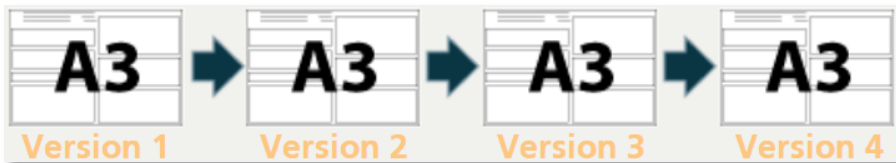
Because the process has been developed as a Lean flow, it is driven by customer demand. Lately, however, the cell supervisors have been complaining that the warehouse is putting wrong parts, or mixed parts, into the kits – which causes delays in the entire process.

## Title & Accountability

In this example, the team begins the A3 by giving it a clear, descriptive title, and establishing ownership. Clear ownership is essential. It ensures that everyone involved can see who is taking responsibility for the problem or situation.

Title:	<u>Warehouse sending wrong parts</u>	
Owner:	<u>J. Linden</u>	Date: <u>11/13/2XXX</u>
Mentor:	<u>R. Hart</u>	Revision: _____

Keep in mind that an A3 is not a static document, but rather it evolves over time. In fact, many A3s are written by hand, in pencil, so that portions can be erased, updated, and written on as new information is learned and the process is updated.



The title should be a clear indication of the situation; it should not imply any causes or solutions. Take a look at the title the team has given to this A3 project. Based on what you know about Lean, the process, and A3 so far, do you think this is an adequate title for this problem?

## Background

Once the team has given the A3 a title and established ownership, the next step is to define any background information that is essential to understanding the extent and importance of the problem. This might include comments on how the problem was discovered, problem symptoms, why the problem is important to the organization's goals, the various parties involved, past performance, and so on.

Take a moment to read the background the team described for our example. Does it completely describe the situation? No, it does not. In fact, it is missing a very important step, which we mentioned earlier. What is that step?

**Essentials may include...**

- How the problem was discovered
- Problem symptoms
- Why the problem is important to the organization's goal
- The various parties involved
- Past performance

**Background:**

[Empty text box for background information]

If you answered, "go to Gemba," you're correct. Let's find out why.

## Go to Gemba

As you recall, the team must not assume it knows what is going on without seeing it first hand. It must seek to understand the current reality of the situation, which often requires looking beneath the surface. To do this, the team should ask people what the real issues are that they face every day. By directly engaging people in their workplace, the team demonstrates its respect for them.



Going to Gemba is not just a stroll through the process; the team must have a purpose. It must know what it is going to observe, and what it hopes to learn. Remember, the Gemba is wherever the activity the team hopes to learn about is being performed.

Once the team finds this point of activity (the Gemba), it observes the structure of the process. On its Gemba walk, it sees the people, equipment, and materials, and observes how everything flows through the process. It also observes exceptions to the process that operators must deal with, and determines waste that can potentially be removed. When going to Gemba, the team looks beneath the surface and validates what it observes. This confirmation is accomplished by interviewing the process associates and performing data analysis.

## Looking at the Completed A3

Once it has seen the process, the team takes another look at the A3 it's completed so far.

In its title description, the team wrote, "Warehouse sending wrong parts." This title seems to imply that if the warehouse people would just do their job right, the problem wouldn't exist. But consider what you just learned about the importance of demonstrating respect for people in their workplace. Deming noted that 95 percent of the problems observed in a process are not due to the operators, but rather to the system the operators are working in. Despite this, there is a tendency to blame operators when things don't go right. Unfortunately, this seems to be the case with the team's title description.

Recall that in a Lean process, there is a steady flow of product through the value-adding steps, with minimal waste. On its Gemba walk, the team observes that two of the cells, A and C, are experiencing wrong or mixed parts in the kits. This issue disrupts the Lean flow, and requires wasted effort to correct.

After observing the process, the team decides a better title to be, "Support the Lean process flow by providing accurate kits to the work cells." The new title allows the team to search for systemic problems in the process—without placing blame on the people.


Title:	Support Lean Process Flow by Providing Accurate to Cells		
Owner:	J. Linden	Date:	11/13/2XXX
Mentor:	R. Hart	Revision:	A

With the additional information and data that it gathered from observing the process, the team can also expand and add detail to the Background, as shown. Remember, the Background information is critical for communicating the importance of the project, and for motivating people to participate in the improvement effort.

### BACKGROUND

*Production cells receive parts pulled from the storage area and kitted according to customer demand and special requirements. To meet the requirements of a pull process, only the required parts are delivered. Mixed or incorrect parts in the assembly kits will result in delays in this process and missed delivery dates. Production demand is expected to increase 15% in the next 6 months.*

	Work Cell A	Work Cell B	Work Cell C	TOTAL
Out of material	3	2	1	6
Incorrect or mixed parts	12	3	18	33
Tooling not available	2	5	5	12
Unplanned downtime	1	2	4	7
Defective parts	4	3	2	9
Hold for review	1	2	1	4
<b>TOTAL</b>	<b>23</b>	<b>17</b>	<b>31</b>	<b>71</b>

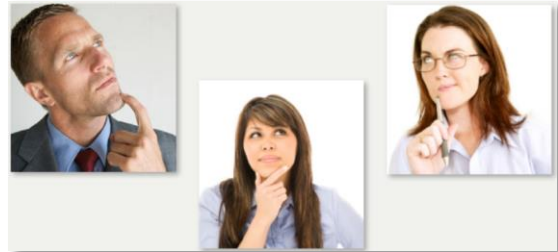




## Current Condition

The Current Condition section of the A3 should answer the following questions: “How do things work today?”, “What is the problem?”, and “What are the baseline metrics?” To accomplish this, the team establishes metrics for measuring progress, then defines the problem based on those metrics.

Too often, however, a team will try to resolve a problem based on its perception of the situation, and will word the problem statement in a way that supports its preconceived ideas. In our example, for instance, the team might be tempted to state that warehouse people don’t follow standard work and are not properly trained. With this problem statement, the team may come up with a quick solution to the urgent problem of incorrect and mixed parts, but it would not solve the problem. For example, the solution could be to train the warehouse workers, but the systemic problems that caused the problem in the first place would still exist.



Remember, the A3 is not just a collection of facts and data. Rather, it should tell a story. Next, we will take a closer look at the key elements of the Current Condition section.

The problem statement describes the pain or symptom experienced by the customer, which can be an external customer or the next step in the process. It must be clear and concise and not contain any speculation as to causes or solutions. Its purpose is to focus the team on the deficiency, and communicate the project significance to others.

The Current Conditions section should also include any visual tools that can help communicate the significance of the problem. Because the space in this section is limited, however, only necessary diagrams and data should be included. Some examples are shown here.



As you learned earlier, A3’s purpose is not simply to document the problem solving process; it should also communicate the results, and serve as a basis for discussion and analysis among the team and the stakeholders.

Once the team has defined the project and current condition, it can ask several questions to help determine whether everything has been considered.

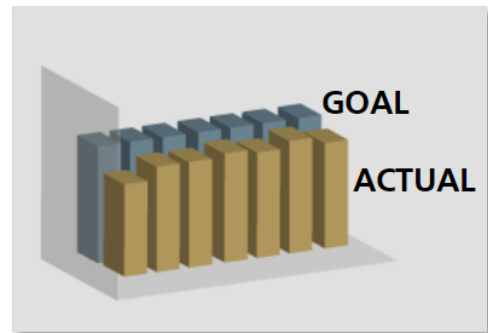
## Reflect and Learn



After the team has defined the problem statement, the next step is to establish the goal. The goal, or objective, is the amount that the primary metric will improve. A common format for a goal statement is to increase (or decrease) the metric, from the baseline to the goal, by the time frame. Let's see how this works in our example.

The percent of kits containing mixed or incorrect parts is the metric. For its goal statement, the team states that it will reduce the number of defective kits due to mixed or incorrect parts, from the baseline of 10 percent to the goal of under 1 percent, by year-end.

Once the team has gathered facts and defined the problem, it's time to reflect and learn from the process. At this point, the team will have analyzed actual performance history in a graph, as it relates to the goal or standard. From its analysis, the team identifies the gap between actual performance and the goal. It also determines if the information collected truly describes its problem, and clarifies the significance to the organization of solving this problem. Next, it determines the amount of improvement needed to close the gap, and the most cost-effective method for proceeding with the investigation.



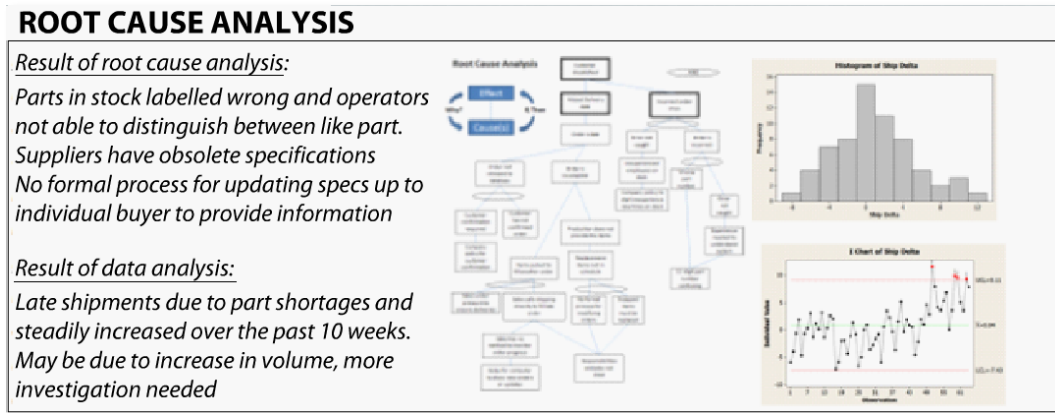
In some cases, the team may not be able to determine the amount of improvement that's needed. This is often the case when the causes are unknown. In such cases, the team may need to complete the next step, Root Cause Analysis, before it can determine the actual fixes and amount of improvement required.

## Root Cause Analysis

There can be many aspects to a problem, and as result, many causes. The challenge is to find the true cause, or causes, at the correct level in the process. At this stage, it is crucial to use effective analysis to identify the potential causes of the problem, and to narrow the field of focus to the most significant ones.

In this phase of the problem-solving process, the team will be exploring areas not previously understood. Indeed, this phase may feel a bit like detective work, with some scientific experimentation thrown in. Often, when the team finds the root causes, the solutions to the problem will become obvious. As Albert Einstein once said, “The important thing is not to stop questioning.”

Several tools can be used for root cause analysis, as shown here. In this section of the A3, the team must clearly describe the root causes of the problem. It should also choose the simplest problem analysis tool to clearly show the cause-and-effect relationship. Since these tools can become complex, the team may find it helpful to include a brief written description of the root causes.



As you learned earlier, the A3 tells a story. And because the root cause analysis will form the basis for the plot, the team should choose the tools and graphics that best tell the story.

## Countermeasures

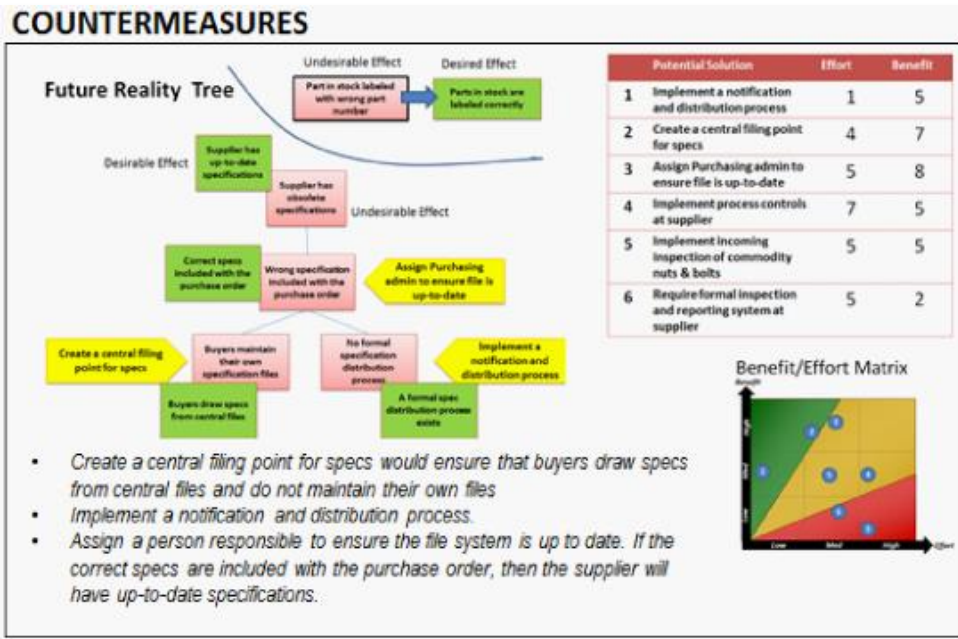
Once the team has determined the amount of improvement needed to close the gap, and the most cost-effective method for proceeding with the investigation, it moves on to countermeasures.

A3 analysis typically uses the term “countermeasure” rather than “solution.” That’s because a problem that is “solved” implies a permanent solution. Think about the detective who refers to a case as “closed” – which means the suspect has been identified based on evidence, and the case is turned over to the courts. But such a condition is rarely satisfied in the business world because solutions inevitably create new problems. A “countermeasure,” on the other hand, refers to the way actions address existing conditions. It serves as a temporary response until a better approach is found or conditions change.

Countermeasures can include both short term and long term actions. If the problem has an immediate effect on a customer, either external or internal, then immediate actions need to be put in place to “Band-Aid” the process until a long term solution can be designed and implemented. For example, if a

long term fix involves designing a new process to reduce defects, then a short term solution might be to place an extra inspection step in the process to screen the product and prevent defects from escaping to the customer. Once the new process is designed, implemented, and tested, the inspection can be eliminated.

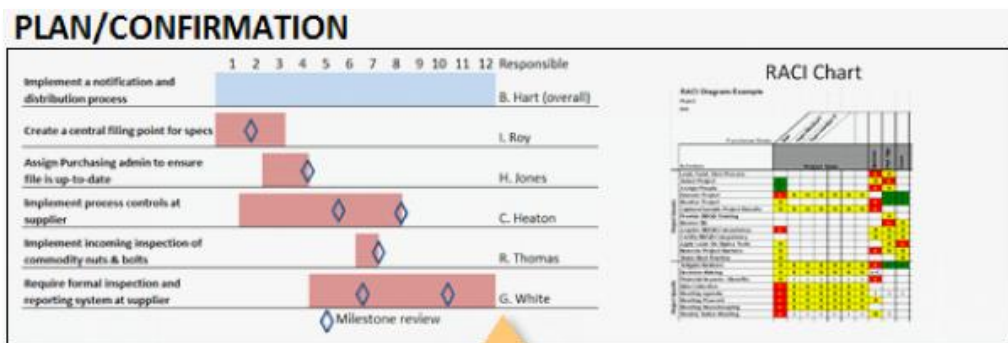
In this section of the A3, the team will define its proposal to reach the future state, or the target conditions. It will also assess how its recommended countermeasures will affect the root cause to achieve the target. Several tools and data that can be included in this section are shown here.



## Plan/Confirmation

Earlier in this module, you learned that Plan-Do-Check-Act, or PDCA, is a management cycle. It is based on the scientific method of proposing a change in the process, implementing the change, monitoring and measuring the results, and taking appropriate action. The power of the PDCA can be fully realized within the systematic approach of A3 thinking.

A3 provides a structure for the PDCA process by capturing what the team is going to do, how it is going to monitor it, and what adjustments it will make based on the results. A3 and PDCA occur together as a learning process.



In the Plan/Confirmation section of the A3, the team identifies what activities are required for implementation; who is responsible; when each task is due; and what the indicators for progress or performance, can be used to assess the success of the project.

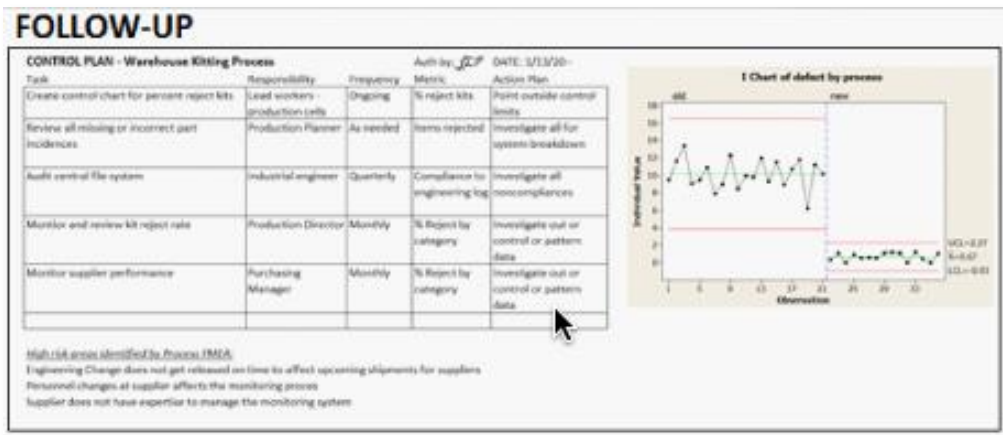
Like other sections in the A3, the Plan/Confirmation section shows, in the clearest way possible, how the old process will be transformed into the new.

There are several tools that can be used and displayed in this section, including a Gantt chart; before and after capability analysis; and control charts. If the project requires a complex project plan, a summary of that plan can be included to show overall progress.

## Follow-up Actions

The actions in the Follow-Up section of the A3 include the Check and Act portions of the PDCA cycle.

As we mentioned earlier, problems are almost never fixed with permanent long-term solutions. Often, a fix may generate another set of issues that must be corrected. For this reason, the Follow-Up step is critically important to long term success. In this step of the A3, the team defines an ongoing process to ensure the gains obtained from the improved process are maintained, and that any other related issues are defined and resolved. It also determines any potential problems and ensures the PDCA effort is ongoing. The Follow-Up section is also a place for the team to capture and share things it learned about the process that will benefit other organizations or sites.



Tools or data used in this section can include an ongoing control plan, FMEA or PPA results, and lessons learned.

## Completed A3

Here is the completed A3. Before we continue, take a moment to look over each completed section.

**Title:** Support Lean Process Flow by Providing Accurate Kits to Cells  
**Owner:** J. Linden **Date:** 11/13/2011  
**Mentor:** R. Hart **Revision:** A

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**BACKGROUND**  
 Production cells receive parts pulled from the storage area and kitted according to customer demand and special requirements. To meet the requirements of a pull process, only the required parts are delivered. Mixed or incorrect parts in the assembly kits will result in delays in this process and missed delivery dates. Production demand is expected to increase 15% in the next 6 months.

	Work Cell A	Work Cell B	Work Cell C	TOTAL
Out of material	1	2	1	6
Incorrect or mixed parts	12	3	18	33
Tooling not available	2	5	5	12
Unplanned downtime	1	2	4	7
Defective parts	4	3	2	9
Hold for review	1	2	1	4
<b>TOTAL</b>	<b>23</b>	<b>17</b>	<b>33</b>	<b>71</b>

**Demands in Units** (Line graph showing demand over time)

**CURRENT CONDITION**  
 Work cells A and C are experiencing a 10% defect rate due to wrong parts or wrong quantities being delivered resulting in wasted effort to replace the incorrect or missing parts.

**GOAL**  
 Reduce defective kits due to mixed or incorrect parts from 10% to <1% by year end.

**ROOT CAUSE ANALYSIS**  
**Result of root cause analysis:**  
 Parts in stock labelled wrong and operators not able to distinguish between like part  
 Suppliers have obsolete specifications  
 No formal process for updating specs- up to individual buyer to provide information  
**Result of data analysis:**  
 Late shipments due to part shortages and steadily increased over the past 10 weeks. May be due to increase in volume, more investigation needed.

**COUNTERMEASURES**

**Future Reality Tree** (Causal chain diagram showing the flow from current conditions to desired future states through countermeasures.)

Problem/Solution	Effect	Result
1. Implement a notification and distribution process	1	5
2. Create a central filing point for specs	4	7
3. Assign Purchasing duties to ensure kits up to date	5	8
4. Implement process controls at supplier	7	5
5. Implement inventory inspection of commodity kits & bins	5	5
6. Require formal negotiation and reporting of material	5	2

**PLAN/CONFIRMATION**

Implement a notification and distribution process (1-12) Responsible: B. Hart (owner)

Create a central filing point for specs (1-12) Responsible: I. King

Assign purchasing duties to ensure kits up to date (1-12) Responsible: B. Hart

Implement process controls at supplier (1-12) Responsible: C. Shelton

Implement inventory inspection of commodity kits & bins (1-12) Responsible: B. Thomas

Require formal negotiation and reporting of material (1-12) Responsible: E. White

**FOLLOW-UP**

**GENCO PLAN: Warehouse Kitting Process**

Task	Responsibility	Frequency	Start Date	End Date	Owner	Notes
Review current kitting process	Production	Weekly	11/13/11	11/13/11	J. Linden	Review kitting process
Review current kitting process	Production	Weekly	11/13/11	11/13/11	J. Linden	Review kitting process
Review current kitting process	Production	Weekly	11/13/11	11/13/11	J. Linden	Review kitting process
Review current kitting process	Production	Weekly	11/13/11	11/13/11	J. Linden	Review kitting process

**1 Chart of Defect by process** (Line graph showing defect rates over time)

### Guidelines for A3 and PDCA

Here are some helpful guidelines to remember when using an A3:

- 1) Don't get hung up on formality. A hand-written A3 is just as effective as a computer-generated one. In other words, it's okay to get messy.
- 2) Get the message across. Be sure the A3, with the PDCA, tells a complete story that a person with a reasonable understanding of the process can follow.
- 3) Use the A3 as a primary form of communication. Use it to control meetings and lock down agreements.

The biggest mistake you can make when using an A3 is not grasping the situation. This happens by assuming you know what the problem is without seeing what is actually happening; assuming you know how to fix a problem without finding out what is causing it; or assuming you know what is causing the problem without confirming it.



And where do you go to grasp the situation? The Gemba!

## A Good A3

As demonstrated throughout this module, the A3 is not simply a form to be filled out, but a communication tool that utilizes the PDCA process. The following are three critical components of a good A3:

It tells a clear and concise story  
It contains objective facts and data; not just speculation, but actual data based on observation  
It solves a problem

In addition, a good A3 engages and aligns the organization by serving as a communication tool, and gets people closer to being good problems solvers and “A3 thinkers.”

