The Lean Toolbox: Where is the thinking cap?

The Lean toolbox is brimming with attractive tools and if you are like most Americans, you can't wait to get your hands on one of those shiny new gadgets and show it off to the neighbors. The problem with tools is that we get wrapped up in what they look like, not in the purpose of having the tool in the first place. Following is an example of where using a "lean tool" has gone bad. In this case, the 5 Why tool was put to work, and nothing happened, but was on display for the neighbors. Let's take a look at why good intentions went awry.

First, a quick glimpse of the picture: a group is in the middle of a kaizen event and someone says there is a chronic problem with a machine. A facilitator of the group says, "Let's use the 5 Why tool to solve this problem", which the group proceeded to do. Following is the line of questioning and answers provided during the 5 Why session:

<u>Problem:</u> The parts carrier doesn't slide on the belt.

Why do the carriers not move along the belt?

The belt is caked with grime.

Why is there grime on the belt?

We are using silicone instead of light oil. Silicone builds up on the belt and attracts grime.

Why are we using silicone?

We need extra lubricant and silicone works for that. We normally wouldn't use silicone.

Why do we need extra lubricant?

There is a problem when the machine tries to screw the assemblies together.

Why is there a problem with screwing the parts together?

There is a problem with the threads, but we can't figure that out.

At this point, the group felt as if they had hit a dead end and threw the problem over the wall to engineering to solve. Fast forward 40 days.

This approach concerned me for several reasons. First, the group had a nice, stylish, flashy form created on the computer and dated 40 days prior to when we observed it on the machine. There was no status on the problem, and further discussion with the operators in the area yielded no other information. Another thing, the group literally stopped questioning at the fifth why. Problem solving sometimes requires multiples streams of questioning and certainly should never be limited to asking "why" only five times. Finally, it wasn't clear how a physical feature on the subassembly was *causing* grime to build up on the belt, thereby causing the carriers to stop on the belt. At first glance, it may be obvious that, “since the parts don’t go together easily, we use more lubricant, which is transferred to the conveyor belt, causing grime to build up. This is basic 5S stuff!” Sadly, when we blindly using Lean tools we inadvertently reduce the credibility of a continuous improvement program.

Here is the thing about lean tools: when you strip all of the gadgetry away there is a simple thinking mechanism behind *each and every tool*. When we use a table saw, we always put on our safety glasses, because that’s *how* you do the job safely. When you pull a lean tool out of the toolbox, make sure you put your thinking cap on first; otherwise the tool is useless *as a skill development tool*. The by-product and nice benefit of 5 Why, and most lean tools, is that some nasty little problems get solved. However, the primary purpose of 5 Why is to develop a questioning attitude within a person. We do this so we can quickly grasp the situation on hand, which in turn leads to developing our ability to see cause-and-effect. Cause-and-effect thinking allows us to rapidly jump up-and-down the causal chain of a problem, making us better problem solvers. This is simply called problem consciousness and is a hallmark characteristic of the people working within Toyota. This causal thinking is described in The Toyota Way Fieldbook, by Jeffrey Liker & David Meier. Causal thinking can be used to verify our line of questioning when using 5 Why’s. Let’s use causal thinking to try and verify the example above. First we must assume that the thread problem has been resolved. If this is true than the carrier stops will be reduced or eliminated:

Problem: The parts carrier doesn’t slide on the belt.
Why do the carriers not move along the belt?
The belt is caked with grime.
Why is there grime on the belt?
We are using silicone instead of light oil. Silicone builds up on the belt and attracts grime.
Why are we using silicone?
We need extra lubricant and silicone works for that. We normally wouldn’t use silicone.
Why do we need extra lubricant?
There is a problem when the machine tries to screw the assemblies together.
Why is there a problem with screwing the parts together?
There is a problem with the threads, but we can’t figure that out.
Root Cause: The thread problem is solved by engineering, therefore
There is no problem with the threads
Therefore
The machine can screw the parts together
Therefore
We can use the right lubricant in the right amount
Therefore
The right amount and right type of lubricant doesn’t attract grime,
Therefore
The belt is not caked with grime
Therefore
Resolution: We have no more carrier/belt stoppages

When we posed this line of causal thinking to the operators, the *immediate* response was: "Solving the thread problem won't eliminate carrier stops. There is grime all over the belt, but they always hang up only in that corner of the belt. Why not everywhere else?"

This response prompted us to resume a new line of questioning, coupled with direct observation and experimentation of the problem:

"What is the problem?"

"The carriers stop on the belt."

"What does this do to you and your teammates?"

"Well, it's a real annoyance having to clear those jams all of the time. As a result, we never meet our production numbers."

"So, is the real problem that productivity is lower than target in this work cell?"

"Yes, you could say that, but we just really want the carrier problem to stop."

<u>Problem Statement:</u> Productivity is low in the work cell.

Why is production low in the work cell?

Because the machine is always down?

Why is the machine down?

Mostly because the carriers stop on the belt.

Why do carriers stop on the belt?

We don't know. (Observe the stoppages.)

Why do the carriers always stop in one corner and no other spot on the belt?

The carriers tend to rattle around that corner and get hung up on the rail.

Why do they get rattle and hang up? (Observe & isolate by removing the rail.)

Wear patterns and bent rail bind up the carrier as it navigates the corners.

Why are the rails necessary?

To prevent the carriers from shingling and falling off the track.

Why do we think this is the only way to prevent these problems?

To which we then tested this last question by removing the upper, outer rail, to see if this indeed was the purpose. It turns out that a lower, outer rail was present, allowing the carrier to freely 'bump' its way around the corner, rather than 'push' its way through a wavy sandwich of worn guiderails. The fear of "shingling" was unwarranted also, since gravity keeps the heavy carriers from lifting off the track and an inner, upper rail kept carriers flat anyway.

Again, we must verify that our line of thinking is correct, by direct observation and causal thinking:

<u>Problem:</u> Productivity is low in the work cell.

Why is production low in the work cell?
Because the machine is always down?
Why is the machine down?
Mostly because the carriers stop on the belt.
Why do carriers stop on the belt?
We don't know. (Observe the stoppages.)
Why do the carriers always stop in one corner and no other spot on the belt?
The carriers tend to rattle there way around that corner and get hung up on the rail.
Why do they get rattle and hang up? (Observe the problem. Isolate by removing the rail.)
The wear patterns and bent rail bind up the carrier as it navigates the corners.
Why are the rails necessary?
To prevent the carriers from shingling and falling off the track.
Why do we believe this is the only way to prevent shingling and misalignment?

Root cause: Removal of the outer rail revealed an outer bumper for the carrier to follow. It was also concluded that the rails didn't prevent shingling because the carriers can't shingle due to their weight and geometry. The outer rails and natural wear are the root cause of binding in the corner. ***Remove the outer rail.***

Cause & Effect
Verification

Therefore,
The carriers can't fall of the track and they do not shingle anyway.
Therefore,
Since the outer rail isn't present, it can't bind the carriers as they bump around the corner.
Therefore,
The carriers always move freely around the corner.
Therefore,
The carriers do not stop on the corner.
Therefore,
Carrier stops are no longer a cause of machine downtime.
Therefore,
The machine downtime is reduced by 25 stoppages per hour.
Therefore,

<u>Resolution:</u> Productivity is increased by 5 units per hour.

Notice that our 5 Why questioning from forty days ago couldn't be verified: that the right amount and type of lubricant would eliminate or even reduce the stoppages, because it was *directly observed* that other root causes existed, i.e., "why do stops occur only in one spot, when the grime is built up *everywhere around the belt?"*

In the second round of 5 Whys, it was directly observed that the stoppages were eliminated and we can verify that with our causal thinking. Finally, we must be sure to verify all the way up-and-down the causal chain; if we fail to do so, we may be going down the wrong trail. In summary, there are several lessons learned in this example:

1) The stoppages were not the real problem; the low productivity was the problem. One *root cause* of low productivity was carrier stoppages on the machine. 5 Why can be used to develop your problem statements by grasping the situation. In doing so, be sure to first properly frame your problems around Quality, Cost, Delivery and Safety measures.
2) Don't ever stop at literally five "whys". Ask why as many times as possible, i.e., adapt to the thinking and dig for as long as it takes. Expect to start over from scratch from time to time.
3) Act on the solution as quickly as possible. Don't pass the buck to someone else who has not shared in the line of thinking that has brought you to a solution.
4) Don't ever assume your thinking is correct! Use the causal thinking to prove out cause-and-effect in order to check your thinking.
5) Don't use lean tools without coupling it with the power of *direct observation and experimentation.* For example, 5 Why is not something to be done from behind a desk.
6) Don't get hung up on creating a form for 5 Why. If you do focus on standardizing the form, you are focusing on the tool and not the critical thinking skill. Rather, get some experience with someone who understands 5 Why, cause-and-effect, and in general is a good problem solver. Once you are comfortable with it, teach 5 Why thinking to someone else. This is good practice for both teacher and student.
7) Do not concern yourself with time. 5 Why is often labeled as a "simple tool" and for the most part it is, *once you get enough experience and practice with it.* The key point to the time element is patience and practice. It takes time to develop your problem consciousness, so don't expect to fill out a 5 Why form and have your problems solved.

For the most part, the lessons learned here are true for almost every lean tool. Lean is about developing people using tools that take time to learn and master. The beautiful by-product of this special, skill-development program is that business processes are drastically improved! Therefore, on the surface they look simple, but the tools are meant to tap into the most untapped resource in the world, our minds.

About the author: Bryan Lund is a Lean Coordinator in the Global Lean Office for Energizer Battery Manufacturing. www.energizer.com. Bryan is also involved with the reintroduction of the WWII production improvement program, Training Within Industry, or, TWI. Many elements of TWI, notably Job Instruction Training, are fundamental to maintaining stability and improvements within the Toyota Production System. Learn more about TWI at our local SME #204 website: Training Within Industry .