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Lateral Thinking: The Key to Effective Deviation Investigation

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In the quest to determine why a deviation has occurred, there are many roadblocks that can keep the problem from being solved. Time constraints that force the investigator to move quickly through the problem-solving process, investigators who are overwhelmed with other responsibilities besides solving the problem, and management's reluctance to accept responsibility for deviations.

Often a symptom, and not the root cause, is found. This can be attributed to many issues, but the authors argue that the biggest challenges to getting to root cause are "mental models" and "paradigms," that create blinders and prevent seeing the real root cause. The following offers a classic example of these phenomena.

An instructor for a class in problem solving for investigations begins her course by stating the following:

"I am going to state a riddle. Your job is to solve the riddle. I will make a statement, and then ask you a question. You can only ask me yes or no questions to try and solve the problem. I can answer however I like, as long as I am honest. Now here is the riddle: Two people die in a cabin in the woods. How did they die?"

As the question sinks in, the class begins to ask questions.

"Was it murder?" one asks.

"No" is the reply.

"Did the cabin have a fireplace?" another asked.

"Yes" is the reply

"Was there a fire in the fireplace?"

"No."

"Were they attacked by a wild animal?"

"No."

All the questions are good questions. Even a couple of root causes (actually symptoms) are offered. The questions and offered solutions take the group down a path to solve the riddle. Unfortunately, it's the wrong path. If the class continues down this line of questioning surrounding a cabin in the woods, they will not solve the riddle. Why? Because the riddle is not about a "cabin" in the "woods." It's about a "cabin in the woods the cabin of a plane that has crashed in the woods." Now, when you are done groaning, let's look at what happened with this riddle.

The participants of the class, as well as the reader of this article, when told the riddle about a cabin in the woods, most likely had a picture of a log cabin or A-frame cabin out in the woods somewhere. The human species' incessant need to classify all data that they take in is what the success of this riddle is based on. When one hears the words "cabin in the woods," the classification process brings a picture in the mind of a "cabin" and of "woods." Since the classification process puts these pictures into the mind, then all questions asked to solve the riddle are based on those pictures, and any offered solution is based on those same pictures. As long as the pictures of a cabin and woods remain, the questions will focus on them, and the puzzle will not be solved. Usually, only a hint about the classification of the word cabin will help the class solve the puzzle. It is the experience of the authors that it is very rare for any class to solve the riddle without at least one hint. That is the power of classification.

Classification, frames, filters, and mental models are all rooted in the theory of constructivism, which holds that we learn by building (constructing) new ideas or concepts based on current or past knowledge1. As very young children, when we were shown a picture of an object that has a round, pole-like structure that is brown in color, and has literally tens of hundreds of small, green, tear-drop like objects at the top, we were told this was a tree. From that point forward, building on what we know, any object that looks similar to that first experience with a tree, we call a tree—even if it is not.

On a recent trip to Connecticut, two of the authors were driving up the expressway from long Island. As they entered Connecticut, and were discussing how the previous training had gone, one glanced up, and saw a huge tree standing out amongst the forest of trees surrounding it. It was a beautiful brown with dark green leaves shining brightly in the sunshine. It stood out because the other trees didn't have any leaves – it was still win- ter in Connecticut. That large tree that the authors saw was not a tree, but a cellular tower disguised as a tree. It took a few minutes for the authors to realize that what they had seen was not a real tree—because classification is so ingrained in the human mind. This classification process—also known as framing or mental models—makes the act of investigation very difficult. If a problem is discovered, it is classified as "this" or "that," based on our frames or mental models. Trying to get to root cause is then very difficult, because of the mental model present in the investigator. Rather than getting to root cause, mental models allow us to assume certain things about the problem. Because of classification and mental models, what is usually solved is a symptom—not the root cause.

The concept of mental models—first put forth by Peter Senge in his book, "*The Fifth Discipline*,"—perhaps is closer to explaining the phenomena. Mental models, according to Senge, are deeply held images or beliefs of how the world works. These images or beliefs, "limit us to familiar ways of thinking and acting." 2

This type of thinking—mental models—Senge says, has actually been discussed as far back as plato and his parable of the cave. Additionally, the fable "The Emperor's New Clothes" is a classic tale about people bound by mental models. The image, or mental model, of the Emperor's dignity kept them from seeing his nakedness as it truly was.3

Senge also states that, "Our mental models determine not only how we make sense of the world, but how we act." 4 If that is the case, then think of what this means to those who investigate deviations. If mental models limit thinking, determine how one makes sense of the world and determine how one acts, then thinking the way one usually does will not solve problems! Einstein said it best when he said, "The world we have made as a result of the level of thinking we have done thus far creates problems we cannot solve with the same type of thinking used to create them."

An incident from the manufacturing industry may help to illustrate this point. A machine in a particular manufacturing flow evaporates metal onto silicon. When the machine suddenly loses power and stops running, a maintenance technician is called in to fix the problem. Having seen this problem before (classification), the maintenance technician immediately checks a fuse in the machine. It is blown, so he replaces the fuse. The machine is turned on and works fine.

A week later, the machine again stops working. The same maintenance technician returns
and, knowing the machine, checks the fuse. It is blown again. however, this time the technician can't believe the fuse blew for no reason, so he assumes the wiring must be bad, and replaces the wire and fuse. The machine is turned on and runs, as it should—for another week. The third time it happens, the same technician, seeing the fuse is blown again, and knowing that the wiring is fine, decides that the power outlet must be bad. He replaces the outlet and the fuse. The machine runs for three days before losing power and stopping again. When the maintenance manager hears that the machine is down again, he orders a full teardown of the machine. While performing the teardown, a screwdriver is found resting inside the machine, near two electrical contacts. Further investigation finds that vibration from the machine running would move the screwdriver around the inside of the machine, where it would touch the contacts and short out the machine.

This example illustrates how experience (classification) can taint our problem-solving abilities. Because the technician was familiar with this problem, he knew upfront how to solve the problem. His experience told him what to do. If the technician had utilized lateral thinking (come at the problem from different angles; use a creativity tool to list possible root causes) during his initial investigation of the problem, without assuming anything, he would have had a better chance of discovering the root cause upfront—not a symptom. Solving the problem and not the symptoms, would have saved time and money.

This example also brings up the concept of cost/benefit analysis for this process. While no full scale analyses have been conducted, anecdotal evidence from several teams and individuals who have used this process, have mentioned that while it takes more time upfront to conduct lateral thinking exercises, the overall time spent in the problem-solving process is reduced. Additionally, less repeat investigations have occurred, suggesting that lateral thinking tool use does help to get to root cause.

In perhaps a more familiar example, looking at a common ailment with cars may help. Upon walking out to his vehicle, an owner notices that water is dripping from underneath his car, in the area of the front part of the engine. Because of classification, the driver immediately believes that his car has developed a leak. But by using a quick creativity tool (commonly known as the “What if?” metaphor model), the driver comes up with other possible causes of the water drip (“What if a sprinkler came on, and had hit my car?” “What if the humidity is high, and the drip is nothing more than condensation?”), quickly tests each hypothesis, and concludes that the drip, is, in fact, condensation—a problem not worth worrying about.

While classification, mental models, and frames make it difficult to investigate, and get to root cause of deviations, they are necessary for the survival of the species. If one were walking down a metal track—two parallel metal beams laying four feet apart, separated by wooden posts, mental models and classification would indicate that one is walking down a railroad track. And if one were to hear a loud, piercing whistle while walking down these tracks—frames would alert one to an oncoming train—and the need to jump off the tracks to survive. As mentioned earlier, this need for mental models and frames is what makes investigations and root cause so difficult to get to. The key is to be aware of the models and frames while conducting an investigation.

Another factor that limits deviation investigation effectiveness is the idea of paradigms in the scientific community. prior to Thomas Kuhn, who redefined the term in 1962, a paradigm merely meant an example. Kuhn, however, defined paradigm more narrowly, stating that it was an “archetypal experiment or problem-solution that implicitly tells the scientist how to look at the world.” 5 In effect, a paradigm created a mental model that scientists used to explain various phenomena in the world. He called this “normal science.” In Kuhn’s view, “normal science” is predicated on the assumption that the scientific community knows what the world is like and takes great pains to defend that assumption.6

According to Kuhn, “normal science often suppresses fundamental novelties because they are necessarily subversive of its basic commitments.” He adds that research is a “strenuous and devoted attempt to force nature into the conceptual boxes supplied by professional education.” 7

In other words, because of paradigms, scientists or anyone following a structured approach to discovery, dismiss any challenge that does not fit into the current model or “box.”

An additional hindrance to effective deviation investigations is the concept of left brain and right brain dominance. The concept, developed after thorough research on brain dominance by Roger Sperry in the early 1960s, poses that individuals are either right-brain or left-brain dominant. Left-brain dominant individuals are sequential in their logic.

If the phrase “One, two, three,” is uttered in front of them, they’ll more than likely finish it with, “four, five, six.” right-brain dominant individuals however, are relational in their logic. They tend to be intuitive and sideways thinkers. Utter the same “One, two, three,” phrase in front of them, they are more than likely to finish with “brown, football, six.” To the left-brainer, there is no logic to this because it is not sequential. To the right-brainer, what was uttered was perfectly logical for them. Somehow, there is a relationship between the items listed by the right- brainer.

Left-brain dominant people then, tend to want sequential logic, and follow accepted patterns (mental models) when they think. This limits a left-brain dominant thinker’s ability to effectively problem solve. Right-brain dominant people tend to use relational logic, and not follow accepted patterns when they think. This too, limits a right-brain dominant thinker’s ability to effectively problem solve. Both left- and right-brain dominant thinkers suffer from their own mental models or frames that limit effective problem solving. It is important to note here that the authors are not advocating right-brain dominant thinkers over left-brain dominant thinkers—or left over right. As will be shown later, it is necessary to use both hemispheres while conducting and reporting investigations.

With more than 85 years of combined experience, the authors have seen predominantly left- brain thinkers in most managerial positions in industry. It is important to remember that this left-brain dominance needs to be tempered with right-brain activities to be most effective in investigating problems.

So how then can deviation investigators, whether left or right-brain dominant thinkers, better solve problems? Through the use of creative thinking—in particular, lateral thinking.

Creative thinking is the concept of thinking differently than one is used to. If one agrees on the definition of creativity as the ability to see something new in something old, then creative thinking is challenging accepted mental models or frames. And to take it one step further, lateral thinking is the tool used to challenge.

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In the standard problem-solving approach, as seen in *Figure 1*, one will typically see a multi-step system for problem solving. Generally speaking, the steps include identifying the problem, identifying root cause, identifying a solution, implementing the solution, and monitoring performance.

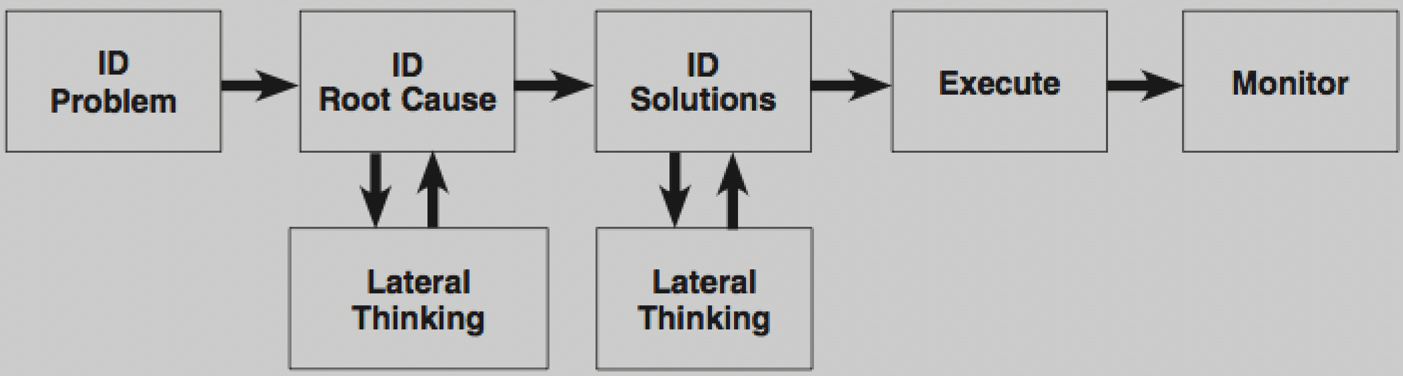
In the traditional approach to solving problems, the tendency of many practitioners is to utilize their experiences to help solve the problem. This is the logical, left-brain approach. Unfortunately, this is also precisely what limits one's ability to get to the real root cause. This reliance on classification keeps other possibilities out of the running.

With creativity and lateral thinking, as shown in the earlier examples of the problem machine and the car leak, problem-solvers are forced to step outside of common thought patterns, and to use "unorthodox" methods of thinking.

These "unorthodox" methods of thinking are primarily used during Step 2 (ID root Cause) and Step 3 (ID Solutions) of the problem-solving process, as shown in *Figure 2*. During both of these steps, the need to look for all possible root causes and several alternate solutions, demands using creativity tools like lateral thinking to generate as many possibilities as possible. If one doesn't use creative tools here, then one's mental model for problem-solving kicks in, limiting one's thinking, and thus, limiting the opportunities to get to true root cause.

Figure 2

Enhanced Generic Problem Solving Steps



Edward de Bono, an expert in unorthodox, or lateral thinking concepts, stated in his book, "Serious Creativity" that the entry for the definition of lateral thinking found in the Concise Oxford Dictionary reads: "seeking to solve problems by unorthodox or apparently illogical methods."8

Lateral thinking then, is about looking at a problem from different angles, using different perceptions and different points of view. In other words, challenging the frames, filters, and mental models that guide one's thinking. Or of using the right side of the brain—the "illogical," creative side—to help solve problems.

If one were to peer into the problem-solving instructor's class again, one would notice on the walls, examples of the problem-solving methodology and tools presented during the course: a fish- bone (cause and effect) diagram, mind-mapping drawings (an individualized brain-storming tool), and a WHOOps diagram (an effective tool that maps sequences of events prior to a problem occurring, combined with a 5 Why analysis), to name just a few. Additionally, one notices the letters BSAINX-lEATNTEARS written on a white board (an exercise in creativity); An easel pad with the phrase "how is _______ like ________" written on it sits in a corner. These are examples of the tools used to enhance creative and lateral thinking.

The "how is . . ." phrase is known as the metaphor model. It is one of the easiest creativity tools available. It is also one of the most effective tools to show an individual that, though he or she may think they are not creative (as most people tend to think), they are creative. An example would be "how is your job like driving on the freeway?" The goal is for the individual to answer the question. Typical answers for this exercise include: both have potholes; one needs to know how to merge; there are varying speeds for both; both are, at times, rife with chaos. Exercises such as this, along with the brain teasers used, help the student to see how mental models and classification can tint one's investigation. To be the best investigator one can be, lateral thinking is necessary.

While the problem-solving process is ripe for using the right brain and lateral thinking (What could have happened to cause this deviation? Why did this deviation occur?), left brain and vertical thinking (logical, sequentially logical thinking) is critical when the second half of the process, writing the report, comes into play. It would be unacceptable to conjecture during the writing of the investigation report. What has to happen is to list the sequence of events (vertical thinking), list the evidence supporting the root cause (vertical thinking), and the conclusion/summary (vertical thinking).

Again, peering into the instructor's class, one sees the utilization of the tools learned and used as participants write a very clear and concise report of the deviation, and what was found during the investigation. The observer would see that when a second riddle is presented to the class (A man walks into a bar, and asks the bartender for a drink. The bartender reaches underneath the bar, pulls out a gun, and puts it in the face of the man. The man smiles, says thank you, and walks out of the bar. Why?) It is solved in a much shorter time (the man had hiccups and the bartender scared them out of him), and the written report identifies the true root cause—not a symptom.

More importantly, anecdotal evidence from several sites, since the delivery of this information, shows that real investigations, not just classroom exercises, are shown to be more thorough and the report writing much improved after attendance in this class. As mentioned earlier, teams have seen reduced times for solving problems, improved analyses, and less repeat offenders in investigations conducted over the course of the last year. But stay tuned. however, quantifiable data from several sites is currently being collected, and this information will be shared in a future article.

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