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Solving Problems through Creative Thinking



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Setpoint provides lean industrial automation equipment customized for specific manufacturing processes.

Solving Problems through Creative Thinking

Have you ever solved a problem by isolating one necessary part? Have you ever stored one box inside another to save space? By doing so, you were unknowingly using two techniques from the 40 TRIZ principles: the “taking out” and “nested doll” techniques. Every creative thinker has naturally used TRIZ principles. By learning the principles and applying them to creative thinking, we can start systematically solving problems we encounter.

The 40 TRIZ principles were created by a Russian engineer named Genrich Altshuller. TRIZ is an acronym for a Russian phrase that translates to the “Theory of Inventive Problem Solving.” One of Altshuller’s first jobs was working in a patent office reviewing invention proposals. This piqued his interest in the process of creativity, and he immediately wanted to know how inventors came up with the ideas for their inventions. In studying hundreds of thousands of patents, he concluded that there are 1,500 basic problems that can be solved by applying one or more of the 40 standard answers.

What We Think We Know

Mark Fox discusses the 40 TRIZ principles, creative thinking, and problem solving in his book *Da Vinci and the 40 Answers*. He suggests that one of the greatest obstacles to creativity is analytical thinking. He summarizes creative thinking and the problem-solving process in a few statements:

- “Judgment kills creativity.” (Fox 76)
- “One of the major roadblocks to creative thinking is the assumption that there is only one right answer to any problem.” (Fox 82)
- “Curiosity itself is killed by conventional wisdom.” (Fox 41)

According to Fox, people with engineering minds could dismiss many potential ideas simply based on what they think they know or understand. This is a serious impediment to creativity. When stuck on a problem, the best solution could be clearing your mind of what you think you know and re-addressing the problem with no preconceived notions.



Are you thinking inside or outside the box?

Fox also once said, “everything you know is wrong.” (Fox 34) While this quote may be a bit extreme, it illustrates the point that if we depend on what we know, or think we know, our creativity is inhibited.

George Bernard Shaw is quoted as saying, “The reasonable man adapts himself to the world; the unreasonable one persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.” (Fox 17) We have to be a little unreasonable to step outside of conventional wisdom and knowledge. If we are to think creatively, we must unlearn what we have learned and leave all assumptions behind.

Fox illustrates this concept with a solar radiometer, a light bulb-shaped device with paddles that spin when exposed to sunlight. According to Fox, no one completely knows how solar radiometers work. However, schools teach one or more theories as fact, eliminating all curiosity on the part of the students and leaving everyone to wonder if it will ever be fully explained. If we think we have an answer, we don’t try to discover or invent another answer.



Right Brain vs. Left Brain

Most people are familiar with the differences between right- and left-brain thinking. Simply stated, the right side of the brain is responsible for most creative thinking and the left side is responsible for analytical and logical thinking. Engineering people generally work in their left brain - the logical side. As a result, they are able to design impressive machines and solve complex formulas. But this left-brain thinking may cause them to suffer from “paralysis by analysis.”

Creative solutions often start as ridiculous - and illogical - ideas. Sometimes it is even mistakes that, when built upon, become revolutionary innovations. Take for example the microwave oven and the drug Viagra: both of these inventions materialized during attempts to solve completely different problems. Because the people working on these solutions stepped out of their left brains long enough to follow their curiosity, these extremely profitable products came to market.

Rules of Brainstorming

Most people are familiar with the term brainstorming, but many aren't aware that rules exist for the most productive brainstorming. These rules are simple to follow and encourage more ideas and more creativity. Rule one, “Write down as many ideas as possible,” could be hindered if someone in the brainstorming group declares the idea as stupid. The ideas might actually be stupid, but you don't know what other ideas might have been sparked by it. Albert Einstein once said, “If at first the idea is not absurd, then there is no hope for it.” (Fox 126)

Rules for proper brainstorming must prohibit judgment of others' ideas and promote ridiculous and wild ideas. It is also a good idea to include people that are not

Rules of Brainstorming:

1. Write down as many ideas as possible
2. Encourage wild, exaggerated, ridiculous ideas
3. Do not discuss ideas in detail
4. Snowball on others' ideas
5. Do not judge others' ideas
6. Leave titles at the door—there is no boss
7. Invite “outsiders”
8. Include between 8 and 12 participants

directly associated or knowledgeable on the subject you are discussing in the brainstorming meeting. These people that don't have preconceived "knowledge" may start some very interesting threads of thought.

The Lenses of TRIZ

Fox uses a metaphor of using different lenses to find answers to problems as a way to describe the TRIZ principles. If you look at a problem through one lens, you could find an innovative idea or solution. If you look through another, a different innovative idea or solution could be found. The goal is to eliminate the contradiction and improve the process. You can't apply every lens to all situations, but often more than one can serve to build answers to a problem.

You can use the analogy of physical lenses to understand this concept. Suppose you have something that is too small to see. You have several lenses that you could choose from: a prescription bifocal lens, a magnifying glass lens, or a microscope lens. If you are trying to read the directions on a medicine bottle, bifocal glasses or a magnifying glass would suffice. However, if you are trying to see the tiny ear mites from your cat's ear, you will probably need the microscope lens.

Here are the 40 different lenses that TRIZ describes:

- Segmentation
- Taking Out
- Local Quality
- Asymmetry
- Merging
- Multifunctionality or Universality
- Nested Doll
- Weight Compensation
- Preliminary Counteraction
- Preliminary Action
- Beforehand Compensation
- Equipotentiality
- The Other Way Around
- Curvature
- Dynamics
- Partial or Excessive Actions
- Another Dimension
- Mechanical Vibration
- Periodic Action
- Continuity of Useful Action
- Skipping
- Blessing in Disguise
- Feedback
- Intermediary
- Self Service
- Copying
- Cheap Disposables
- Mechanical Interaction Substitution
- Pneumatics and Hydraulics
- Flexible Shells and Thin Films
- Porous Materials
- Color / Clarity Changes
- Homogeneity
- Discarding and Recovering
- Parameter Changes
- Phase Transitions
- Thermal Expansion
- Strong Oxidants
- Inert Atmosphere
- Composite Materials

Each principle is explained in depth in Mark Fox's book and at www.triz40.com or www.triz-journal.com.

Many of these lenses have real-life examples. To give Post-it notes a boost, 3M used the Color/Clarity lens and added new colors to the product line to give people more choices.

Disney has used many different lenses to solve their problems. They used the Dimension lens for their theme parks to create a network of underground tunnels for staff to take out the trash and move around the park when not in costume. Disney also combines the Dimension lens with the Color Change lens by incorporating HVAC ducts and pipes into the decoration theme of the building by painting them in interesting color schemes.

Using the different lenses is also apparent throughout history. During prohibition, bootleggers used to carry large blocks of salt on their ships. When they sighted the authorities, they would tie these blocks of salt to the barrels of alcohol and throw everything overboard where they would sink due to the density of the salt. When the ship was searched, no contraband would be found, but as the salt dissolved, the barrels would float back to the top of the water for retrieval. They were using the Intermediary lens that works to improve the final product, but doesn't necessarily become part of the final product.

Setpoint has also used these lenses. A customer's product was being made with a complicated machine that did its job well but was not lean. Setpoint used the Segmentation lens to redesign the machine and separate the process into different stages. By doing this, the machinery became simpler to design, build, and maintain and met the lean manufacturing requirements of the customer.

For most of us, coming up with that brilliant idea is something that happens less often than we would like. The concepts in Mark Fox's book can be very useful, and some of them we may already use in one form or another. We have all been involved in a brainstorming session and have used some of the principals of TRIZ. These principals can be used in all aspects of our lives, not just the technical issues. Applying these principals when there is a problem helps us achieve that "brilliant" idea more often.

Conclusion:

THINK: There are other ways of thinking and solving problems out there. You don't have to be a genius to have a great idea.

FEEL: You don't have to be Walt Disney or Albert Einstein to be a creative thinker. Creativity can be taught; it's not owned by just a few.

DO: Use the tools available. There are other methodologies out there that can further your creative thinking.

Setpoint is the leader in lean automation equipment from concept to functioning completion. Following the Toyota Production System, Setpoint has successfully created custom solutions for a broad variety of industries for over 18 years.

Quotation References:

Fox, Mark Da Vinci and the 40 Answers. Austin, Texas: Wizard Academy Press, 2008.