TRIZ (The Theory of Inventive Problem Solving) Has Arrived

By John Stamey

We have always been fascinated with the almost magical abilities of famous television detectives to figure out "who done it." Names such as Perry Mason, Colombo and Mike Hammer are legendary for their ability to put the pieces of very difficult puzzles together. In much the same way, we marvel at great inventors such as Thomas Edison, Alexander Graham Bell, the Wright Brothers, and of course Bette Nesmith Graham.

In case you don't remember, Bette Nesmith Graham was the mother of Monkees singing group member Mike Nesmith and the inventor of Liquid Paper. Originally called Mistake Out, Bette Graham cooked up the super correction fluid in her kitchen blender in 1956 - ultimately selling the Liquid Paper Company twenty-five years later for almost fifty million dollars.

How do inventors do what they do? How do they see things that the rest of us do not? One answer is found in a fifteen year-old Russian boy named Genrich Altshuller who received one of his first international Russian patent for an underwater diving apparatus. After receiving several more patents before the age of 21, Altshuller was offered employment in the patent department of the Soviet navy. His job was to examine incoming patents, assist patent applicants with their applications and problems, along with creating patentable inventions to help the Russian government.

Examining over 200,000 patents through the years, Altshuller concluded there was actually a “process” through which many inventions were developed. In reviewing the patent applications, he identified contradictions that had existed before the inventions were created. He then identified the inventive principles that were used to remove these contradictions. Years of work resulted in the method of TRIZ, the Russian acronym for Inventive Problem Solving. Altshuller found 39 technical characteristics of system that can be used to describe the system. When you improve one of these characteristics often another characteristic may get worse. Example, if you improve the fuel economy of a car, the power or performance may get worse. If you can overcome this contradiction without compromise, it would lead to the development of a new invention. 40 Principles were found by Altshuller that would eliminate most of the 1,500 + contradictions he had that could be generated by the 39 characteristics.

A well-known example of TRIZ at work came from the redesign of a metal beverage can. This example will give an idea of the types of contradictions that are found in problems requiring inventive solutions. The first step is to identify the problem goal, called the Ideal Final Result (IFR). IFRs are very general, and are not product specific. In our beverage can example, the IFR would be to develop a cylindrical container (more generic than a can) that can support the weight of stacking to human height without damage to cans or the contents held by the container.

The standard technical conflicts in this problem are as follows: the thinner we make the walls of the container, the more stress will be felt by the walls of the container (due to stacking). While the walls of a beverage container could be made thicker, an increase in materials would produce heavier containers. Stacking heavy cans on top of each other could potentially damage containers on the bottom of the stack. Furthermore, additional material could be cost-prohibitive.

Increased strength (an improvement) and increased weight (a worsening) were two opposing forces that could be reconciled with the inventive principle of Segmentation. This Principle, on of the forty inventive principles, states: "Increase the degree of an object's segmentation." The answer is to change the smooth cylindrical surface of the container to a corrugated or wavy surface made up of many "little walls." This approach would increase the edge strength of the cylinder while allowing a thinner (and lighter) material to be used.

The use of TRIZ in solving this problem a number of years ago actually lead to several successful US patents for the improved design of beverage cans. TRIZ has been used successfully in Russia to help solve technical problems and develop patentable inventions for years. It is now finding acceptance in the US, Western Europe, and the Pacific Rim. Samsung recently reported savings of hundreds of millions of dollars by using TRIZ to solve problems and generate inventions have helped fuel the fire. A Michelin Tire design group in Greenville, SC used TRIZ in the development of their revolutionary new Tweel™. The Intel Corporation has had sixteen members of their research and design group trained to use TRIZ in a number of their new projects. Have you used a teeth whitening strip lately? This is another recent application of TRIZ to hit the market.

This April, **TRIZCON2006**, the eighth annual international event hosted by the Altshuller Institute for TRIZ Studies, was held in Milwaukee, WI. One of the primary sponsors of this event was ASQ (American Society of Quality). At the event, Russian educators Tatiana Sidorchuk and Nikolai Khomenko revealed extremely positive results of using TRIZ with young children. Chronicled in their book "Thoughtivity for Kids," the two researchers reported remarkable gains in children’s imagination, goal-oriented problem solving, and speech development. One exercise the authors discussed is worth examining. This technique for overcoming psychological inertia has worked well for engineers to think about their current problem from a new direction.

Students, ages 5 through 10, can benefit from a systematic examination of objects in nature. A systematic examination of an object includes identifying three traits of the object as it currently exists. This examination includes parts of the object (called subsystems), and the natural environment of the object (called the super-system). Once the super-system, system and subsystem have been identified, the student is asked to examine the object in the past and the future. The systematic examination leads to a 9-square matrix such as the in Figure 1, describing a baby sparrow. Exercises such as these expand and exercise the mind of students. The 9-square matrix is used give students a more complete and comprehensive view an object (and hopefully problems they will encounter in the future).

A SPARROW	PAST	PRESENT	FUTURE
SUPER-SYSTEM	Mother-sparrow sitting on the nest and warming the egg	Nest full of baby sparrows	The forest or neighborhood in which the sparrow lives
SYSTEM	Egg	Baby sparrow	Adult sparrow
SUBSYSTEM	Egg shell, white and yoke	Body parts of the baby bird	Body parts of the strong adult bird

FIGURE 1

Also at **TRIZCON2006**, researchers and faculty members from around the world met in Milwaukee to begin formulating a plan to bring elements of TRIZ training to students from K-12 and into college. Ideas deploying TRIZ skills in US education came from faculty members at Penn State, North Carolina State University and Coastal Carolina University.

More information on this initiative may be found at www.TRIZeducation.org,
This website was created the plan to engage young people across the world in the TRIZ CHALLENGE '07, a worldwide innovation and invention challenge for students, K-12 and College. Team The intent of the contest is to engage thousands of young people throughout the world, promoting inventive thinking through TRIZ. The US-based Altshuller TRIZ Institute website, containing links to a number of TRIZ resources, is located at www.aitriz.org.