

TRIZ-Based Tools Promote Innovation

The methodology known as TRIZ (pronounced “trees”), a Russian acronym for the theory of inventive problem solving (TIPS), is emerging as a powerful tool in the United States for problem-solving and technological breakthroughs in industrial companies, universities, and research groups. With the advent of two commercial software packages based on the methodology, as well as a growing number of organizations offering workshops and training, TRIZ may become an industry standard for fostering technological invention, equipment design, and creative problem solving.

TRIZ was first developed by Genrikh (Henry) Altshuller (inset), a Russian patent examiner who rejected the notion that creativity was an entirely intuitive process, proposing that it could be made into an exact science [see “Structured Inventive Thinking,” *The Industrial Physicist*, March 1996]. After thorough analysis of more than 400,000 patented inventions, he discovered that different technological systems pass through similar evolutionary stages, which led him to develop the basis of TRIZ.

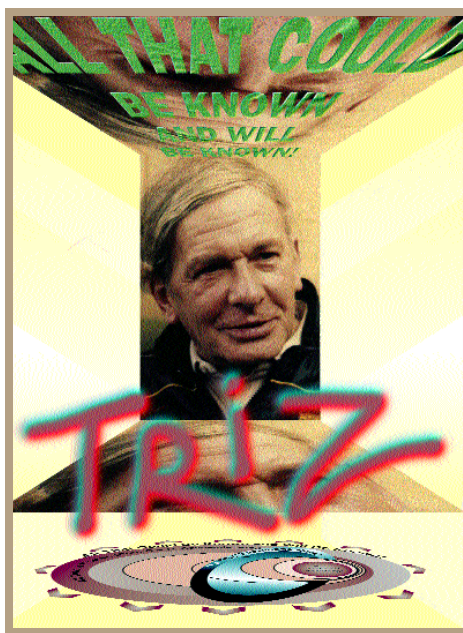
“In the present environment of fierce global competition, it is necessary to quickly develop creative solutions in order to stay in the competitive race,” said Patrick Meathe, executive director of the American Supplier Institute (ASI), of the growing popularity of TRIZ. ASI is a nonprofit company based in Allen Park, Michigan that is dedicated to helping organizations meet the needs of customers through research, training, implementation, and publications on quality improvement techniques.

Software

Two companies producing commercial TRIZ-based software products are the Invention Machine Company in Cambridge, Massachusetts, and Ideation International in Detroit. The two have adopted quite different business strategies. Ideation focuses on a more orthodox educational approach, gradually taking its clients to successive levels until they become self-sufficient with

TRIZ-based software products. The company has sold approximately 1,000 copies of its software worldwide.

“Nobody likes consultants, nobody



wants you to solve their problems for them; they want to solve their own problems,” said Zion Bar-El, Ideation’s president and founder, of this strategy. But Bar-El found that his U.S. clients had difficulty coping with the wealth of knowledge and multipurpose complexity of the method, and were frequently too impatient for quick results to devote the time required to master the necessary skills. Thus, he has adopted a three-step educational approach, supported by three different software aids.

The reasonably priced, Windows-based “Ideator” is an educational tool to introduce beginners to the basics of TRIZ and plant the desire to learn more. The next level consists of both the “Eliminator,” which identifies and removes glitches from a given system, and the “Improver,” which offers improvements to design and manufacturing processes. The final level is a two-day, hands-on workshop in which participants become proficient with the full TRIZ process, using the “Innovation Workbench

System” and “Formulator” software. Bar-El is now collaborating with Frank Harvey at Lehigh University in Bethlehem, Pennsylvania, and David Bush, who teaches engineering and creative design at the University of Minnesota, to produce hypermedia TRIZ-based tools easily accessible to beginners.

Invention Machine has opted for a more broad-based approach. Introduced in 1991, the company’s software is intended to support creative engineering design processes. “We have tried to establish a set of software packages that create a standard procedure for any industrial company to manage innovations, and to help engineers produce elegant solutions in a short time,” said Valery Tsourikov, the company’s founder and president. “Good machines and good inventions are based on good physics, but most engineers don’t know physics. So we married technology and physics.”

Worldwide, more than 3,000 copies of the software are currently in use, predominantly by industrial companies. The package includes three basic problem-solving techniques and corresponding knowledge bases. The “Principles” module offers solutions for more than 1,250 different types of inventive problems. The “Prediction” module allows the user to obtain advanced solutions to problems through the structural transformation of an engineering system. The “Effects” module is used to search for new design concepts by browsing collections of more than 1,200 physical, chemical, and geometrical phenomena.

However, simply buying the commercial packaged software is usually not sufficient to successfully implement TRIZ methodology, even for users with extensive scientific or engineering training. To address this need, ASI holds training workshops for a modified version of TRIZ targeting its U.S. clientele, using Invention Machine software products. “We don’t want to teach the theory, and we’re not trying to create experts,” said Meathe. “We’re just going to give you enough of the theory to understand and incorporate the basic

principles so you can begin to apply it to practical problems.” GOAL/QPC Research of Methuen, Massachusetts, offers TRIZ-based courses and workshops under the name Systemic Innovation, emphasizing its ability to solve basic contradictions at the root of problems, and its technology forecasting feature. The company believes that achieving a technology breakthrough is key both to new product design and also in solving some of the most difficult problems.

Unlike ASI and GOAL/QPC, which limit their scope to engineering applications, the Intellectual Capital Group (ICG) in Franklin, Michigan, is seeking to take TRIZ one step further by extending it to corporate and managerial issues. “While TRIZ methodology has been devoted to engineering tasks, we had the inkling that it could be applied to general business problems,” said Gordon Housworth, ICG’s managing principal, adding that the company is in the process of developing a business application curriculum to bring the methodology into that “softer” market.

Applications

To date, TRIZ has been successfully applied to solve complex technological problems at such corporate giants as Ford Motor Company (Dearborn, Michigan), General Motors (Detroit), Chrysler (Highland Park, Michigan), Rockwell Automotive (Troy, Michigan), Procter & Gamble Co. (Cincinnati, Ohio), 3M (St. Paul, Minnesota), Motorola (Schaumburg, Illinois), and many others, often with spectacular results. “You will probably not cure cancer with it, and it doesn’t function in a ‘soft,’ organizational environment, but you will probably get a payback of 1,000 to 1 for your investment,” said Meathe of the possibilities.

The process can sometimes even lead to unexpected bonus results, according to Julian Blosiu at the Jet Propulsion Laboratory in Pasadena, California. A case study earlier this year applied TRIZ in an attempt to improve the rate of sensitivity of an integrated optical rate sensor for the directional control of satellites some 50 billion miles away from Earth. Sixty-five possible solutions emerged, at least two of patentable quality. This led to the realization that the same concept could be applied to a directional control

system for cars and trucks back on Earth.

A common objection to TRIZ is that it seeks to replace creative inspiration with a scientific methodology. However, most of its proponents are quick to note that the method does not replace human creativity; rather it enables the user to organize a thinking process at a much more sophisticated level. “We don’t want to eliminate innovations,” said Tsourikov. “We want to enhance them by providing logic and a knowledge base for engineers.” While many stress using TRIZ as an inventive tool for technology, Meathe believes its largest application will ultimately be to solve process problems in industrial manufacturing.

TRIZ is certainly not the only methodology available for industrial problem-solving. Two of the most popular alternatives in the United States, both imported from Japan, are Quality Function Deployment (QFD), which stresses employment of team dynamics, and the Taguchi method, which applies a collection of statistical methods to process control. What TRIZ brings to the table is an extensive knowledge database that links physics, chemistry, and geometry.

Nevertheless, there is an emerging consensus that TRIZ ultimately complements rather than competes with these other methods. In fact, Ideation already is working with the QFD Institute to produce a platform-integrated solution to bridge TRIZ with QFD. “Simply having an answer is not enough; you must get that answer into production and make it work,” said Meathe, who also sees a linkage between TRIZ and other quality tools. “In that context, TRIZ becomes one element in a series of processes that can take you from breakthrough technology to actual deployment.”

It remains to be seen whether TRIZ will be just another fad in quality improvement or will endure to become a standardized methodology in U.S. industry. Certainly its proponents are optimistic. Ideation continues to do brisk business, Invention Machine grew nearly 500% last year, and ASI is devoting nearly a quarter of its 1996 budget to TRIZ-related activities. “People are looking for flash. Every time something new comes out, people are in a big rush to make a buck,” said Bar-El. “But TRIZ is not just a fashion that comes and goes.” 