



TRIZ

TRIZ (/ˈtriːz/; Russian: теория решения изобретательских задач, romanized: *teoriya resheniya izobretatelskikh zadach*, lit. 'theory of inventive problem solving') combines an organized, systematic method of problem-solving with analysis and forecasting techniques derived from the study of patterns of invention in global patent literature. The development and improvement of products and technologies in accordance with TRIZ are guided by the laws of technical systems evolution.^{[1][2]} Its development, by Soviet inventor and science-fiction author Genrich Altshuller and his colleagues, began in 1946. In English, TRIZ is typically rendered as the theory of inventive problem solving.^{[3][4]}

TRIZ developed from a foundation of research into hundreds of thousands of inventions in many fields to produce an approach which defines patterns in inventive solutions and the characteristics of the problems these inventions have overcome.^[5] The research has produced three findings:

1. Problems and solutions are repeated across industries and sciences.
2. Patterns of technical evolution are replicated in industries and sciences.
3. The innovations have scientific effects outside the field in which they were developed.

TRIZ applies these findings to create and improve products, services, and systems.^[6]

History

TRIZ was developed by the Soviet inventor and science-fiction writer Genrich Altshuller and his associates. Altshuller began developing TRIZ in 1946 while working in the inventions-inspection department of the Caspian Sea flotilla of the Soviet Navy. His job was to help initiate invention proposals, to rectify and document them, and to prepare applications to the patent office. Altshuller realized that a problem requires an inventive solution if there are technical contradictions (improving one parameter negatively affects another).

His work on what later became TRIZ was interrupted in 1950 by his arrest and 25-year sentence to the Vorkuta Gulag. The arrest was partially triggered by letters he and Raphael Shapiro sent to Stalin, ministers, and newspapers about Soviet government decisions they considered erroneous.^[7] Altshuller and Shapiro were freed during the Khrushchev Thaw which followed Stalin's death in 1953,^[8] and they returned to Baku. The first paper on TRIZ, "On the psychology of inventive creation", was published in 1956 in the *Issues in Psychology (Voprosi Psichologii)* journal.^[9]

Altshuller observed clever and creative people at work, discovering patterns in their thinking with which he developed thinking tools and techniques. The tools included Smart Little People^[10] and Thinking in Time and Scale (or the Screens of Talented Thought).^[11]

In 1986, Altshuller's attention shifted from technical TRIZ to the development of individual creativity. He developed a version of TRIZ for children which was tried in several schools.^[12] After the Cold War, emigrants from the former Soviet Union brought TRIZ to other countries.^[13]

Principles

One tool which evolved as an extension of TRIZ was a contradiction matrix.^[14] The ideal final result (IFR) is the ultimate solution of a problem when the desired result is achieved by itself.^[15]

Altshuller screened patents to discover which contradictions were resolved or eliminated by the invention and how this had been achieved. He developed a set of 40 inventive principles and, later, a matrix of contradictions.^[14] Although TRIZ was developed from analyzing technical systems, it has been used to understand and solve management problems.^[16] The German-based nonprofit European TRIZ Association,^[17] founded in 2000,^[18] hosts conferences with publications.^[19]



TRIZ flowchart



Contradictions matrix



40 principles of TRIZ

Use in industry

Samsung has invested in embedding TRIZ throughout the company.^[20]

BAE Systems and GE also use TRIZ,^[21] Mars has documented how TRIZ led to a new patent for chocolate packaging.^[22] It has been used by Leaffield Engineering, Smart Stabilizer Systems, and Buro Happold to solve problems and generate new patents.^[23]

The automakers Rolls-Royce,^[24] Ford, and Daimler-Chrysler, Johnson & Johnson, aeronautics companies Boeing, NASA, technology companies Hewlett-Packard, Motorola, General Electric, Xerox, IBM, LG, Samsung, Intel, Procter & Gamble, Expedia, and Kodak have used TRIZ methods in projects.^{[8][25][26][27]}

TOP-TRIZ is a modern version of developed and integrated TRIZ methods. "TOP-TRIZ includes further development of problem formulation and problem modeling, development of Standard Solutions into Standard Techniques, further development of ARIZ and Technology Forecasting. TOP-TRIZ has

integrated its methods into a universal and user-friendly system for innovation."^[28] In 1992, several TRIZ practitioners fleeing the collapsing Soviet Union relocated and formed Ideation International.^[29] They developed I-TRIZ, their version of TRIZ.

See also



- [Brainstorming](#)
- [Dimension Time Cost model](#)
- [C-K theory](#)
- [Lateral thinking](#)
- [Morphological analysis](#)
- [Nine windows](#)
- [Systems theory](#)
- [Trial and error](#)
- [Systematic Inventive Thinking](#)

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