TRIZ Method

Idea In Short

TRIZ (Teoriya Resheniya Izobretatelskikh Zadach), the Theory of Inventive Problem Solving, is a powerful methodology for systematic innovation. It provides a structured approach to problem-solving by leveraging a vast database of inventive principles and patterns discovered through the analysis of millions of patents. TRIZ systematically solves inventive problems.

This method emerged from the work of Genrich Altshuller, who studied a vast number of patents to identify recurring patterns of innovation. He discovered that inventive solutions often involve resolving contradictions, either physical or technical, and that these contradictions can be addressed using a set of inventive principles. TRIZ offers a systematic path to solutions.

Key Concepts

At the heart of TRIZ are several key concepts:

- **Contradictions:** TRIZ recognizes that many problems arise from contradictions. A technical contradiction exists when improving one aspect of a system worsens another. For example, increasing the strength of a material might increase its weight. A physical contradiction involves conflicting requirements for a single parameter. For example, a part needs to be both large and small. Identifying these contradictions is the first step in applying TRIZ
- **Inventive Principles:** Altshuller identified 40 inventive principles that are commonly used to resolve contradictions. These principles offer general strategies for innovation, such as segmentation (dividing an object into independent parts), taking out (removing a troublesome part), asymmetry (changing the shape of an object from symmetrical to asymmetrical), and dynamics (allowing an object or its parts to move). Each principle provides specific guidance on how to modify a system to

overcome a contradiction. These principles provide a toolbox for innovation

- **Separation Principles:** When dealing with physical contradictions, TRIZ offers separation principles to resolve conflicting requirements. These principles suggest separating conflicting requirements in time, space, or condition. For example, a part can be large at one time and small at another (separation in time), or large in one location and small in another (separation in space). This allows for seemingly impossible requirements to be met
- **Ideality:** TRIZ strives for ideality, which is the ultimate goal of a system. An ideal system performs its intended function perfectly without any undesirable side effects or costs. While achieving perfect ideality is often impossible, it serves as a guiding principle for innovation and pushes designers to find the most efficient and effective solutions
- **Resources:** TRIZ emphasizes the use of available resources to solve problems. These resources can include material, energy, space, time, and information. By effectively utilizing existing resources, it is often possible to find innovative solutions without requiring significant investment in new materials or technologies. This promotes efficient and cost-effective solutions

The TRIZ process

The TRIZ process typically involves several steps:

1. **Define the Problem:** Clearly articulate the problem and identify the key contradictions. This requires a precise understanding of the current situation and the desired outcome
2. **Formulate the Contradictions:** Express the contradictions in a standard TRIZ format, such as "If we improve X, then Y worsens." This clarifies the conflicting requirements and sets the stage for applying the inventive principles
3. **Apply Inventive Principles:** Use the 40 inventive principles to find potential solutions to the contradictions. This involves reviewing the principles and selecting those that seem most relevant to the specific problem
4. **Evaluate and Refine Solutions:** Evaluate the generated solutions based on feasibility, effectiveness, and cost. Refine the most promising solutions for implementation. This step ensures that the chosen solutions are practical and can be implemented effectively

Case Study - Improving a Vacuum Cleaner's Maneuverability

Imagine a company wants to improve the maneuverability of its upright vacuum cleaners. Currently, users find it difficult to maneuver the vacuum around furniture and in tight spaces. This presents a technical contradiction: a larger vacuum head cleans a wider area but is less maneuverable.

Using TRIZ, the company formulates the contradiction:

> If we increase the size of the vacuum head to clean a wider area, then the maneuverability decreases.

They then consult the 40 inventive principles. Several principles are relevant, including:

- **Principle 1: Segmentation:** Divide the vacuum head into smaller, independently rotating segments. This allows the head to conform to the shape of obstacles and maneuver more easily
- **Principle 2: Taking Out:** Separate the cleaning function from the main body of the vacuum. This could involve creating a detachable handheld unit for cleaning tight spaces
- **Principle 24: Intermediary:** Use a flexible hose or joint to connect the vacuum head to the main body. This allows for greater freedom of movement and easier maneuvering

The company evaluates these potential solutions and decides to focus on a combination of segmentation and intermediary by developing a vacuum head with multiple independently rotating segments connected by a flexible joint. This solution addresses the contradiction by providing a wide cleaning path while maintaining excellent maneuverability. This shows TRIZ's practical application.

Advantages & Potential Limitations

TRIZ offers several significant advantages. It provides a systematic and structured approach to innovation, moving beyond trial and error and relying on proven patterns of inventive solutions. It leverages a vast database of inventive principles, offering a rich source of

potential solutions.

This method can be particularly effective for solving complex technical problems and overcoming difficult contradictions. It encourages thinking outside the box and generates innovative solutions that might not be apparent through traditional brainstorming methods.

TRIZ can also be used to anticipate future trends and develop proactive solutions. By analyzing trends in technology and identifying potential contradictions, organizations can develop innovative products and services before their competitors.

However, there are also some potential limitations to consider. Learning and applying TRIZ effectively requires training and practice. The large number of inventive principles and other tools can be overwhelming for beginners. It takes time and effort to master the methodology.

The method is primarily focused on solving technical problems. It may be less directly applicable to problems involving human behavior, marketing, or organizational dynamics. While some principles can be adapted, its strength lies in technical domains.

Applying TRIZ can sometimes require a significant amount of time and effort, especially for very complex problems. It is crucial to carefully define the problem and formulate the contradictions to ensure that the process is focused and efficient.

Summary

TRIZ is a powerful methodology for systematic innovation. It provides a structured approach to problem-solving by leveraging a vast database of inventive principles and patterns. TRIZ systematically solves inventive problems.