



Introduction to TRIZ

What Is TRIZ?

TRIZ originated in the former USSR and is a Russian acronym for the Theory of Inventive Problem Solving. Developed by Genrich Altshuller, a patent examiner for the Russian navy, it is based on the analysis of thousands of patents and successful inventions. It works on the premise that there are very few totally new inventions, and that most ideas have already been used in other industries or applications. If an innovator could only tap into this huge store of knowledge, this would *shortcut the whole innovation process*.

Altshuller set about looking for commonalities; he identified a set of inventive principles and processes, which he codified to make them useful across different areas of technology and business.

However, it was not until the 1990s that TRIZ was used widely outside Russia. TRIZ specialists have developed the theory further, spending about 3,500 man years and analysing 2.5 million patents from all over the world.

Today, many top companies use TRIZ, including Boeing, Proctor & Gamble, Dow Chemical, Agilent and BMW. They use TRIZ to design better products, less complicated processes and understand disruptive market trends.

Where Can TRIZ Be Applied?

Originally TRIZ was used in an engineering environment for product development or problem solving. Now, however, it has been extended to be useful for:

- Formulating organisational and technical processes
- Defining problems
- Developing or improving products (including services)
- Better management of Intellectual Property.
- Analysing operations
- Identifying optimum results and
- Performing failure analysis.

What Are The Benefits Of TRIZ?

The benefit of TRIZ is that it allows a *systematic approach to innovation* rather than relying on

trial and error. It provides proven and tested solutions to problems, *saving you time and money*.

In addition, the resulting product is likely to be *more innovative*, as the inventor has been able to access knowledge beyond the experience of the team.

How Does TRIZ Work?

The basic tenet of TRIZ is that your situation is not unique and has undoubtedly been encountered before. In order to find a solution, you need to translate your situation into a more generic one, then find out how this has been managed before, and then 'translate' this back into the best solution for you (see *Figure 1* below).

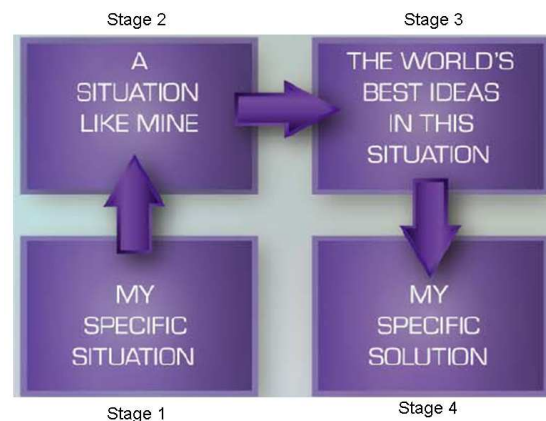


Figure 1 - How TRIZ Works

The way you move from one stage to the next is by applying certain tools and methodologies, hence the term systematic innovation.

Key TRIZ Principles?

TRIZ encourages a new way of thinking and promotes a set of principles to help us do just that.

Inventive Principle 1 – Idealised Final Result

When developing new products, people are often too focused on bringing incremental improvements, rather than looking ahead to the ideal final product. An ideal product would be one which brings all of the benefits, but introduces no costs or harms.

An example might be dishwasher tablets that have a dissolvable outer surface. They save resources because they are not using secondary packaging, and customers like them because they are not spending time opening individual tablets.

Other examples of Idealised Final Result are:

- Products and systems that repair themselves automatically
- Inventory that replenishes itself
- Drugs that are automatically administered according to the current needs of the patient
- Products and services that market themselves to customers

Inventive Principle 2 – Make Effective Use of Resources

Many inventors overlook resources at their disposal when designing a new system. Resources might be tangible (e.g. people, buildings or equipment) or intangible (e.g. Intellectual Property, energy, space, information, or time).

With TRIZ you are encouraged to identify resources that you would not normally consider:

- **Future resources**, e.g. new people with new skills you are planning to recruit
- **External resources**, e.g. members of the board, university associates, equipment at another local business
- **Free resources**, e.g. air, sunlight, relative humidity, space, spare capacity

In this way you can make optimal use of all the resources you have at your disposal.

Inventive Principle 3 – Seek Out And Solve Contradictions

One of the most powerful tools in the TRIZ toolbox is the Contradiction Matrix (see *Figure 2*). This is based on the premise that most innovations occur when you decide not to accept a compromise, e.g. how to make a product stronger without making it heavier, or how to make a product more adaptable without increasing the complexity.

When using the matrix you need to translate your situation into generic parameters (see *Figure 1*) and then see which principles or likely areas for a solution it suggests.

In our example in *Figure 2*, the most likely principle of area for solution is Principle 15 – Dynamisation. Examples of how this has been used include:

- A. Allow a system or object to change to achieve optimal operation under different conditions.
 - Adjustable seats
 - Shape memory alloys
- B. Split an object or system into parts capable of moving relative to each other.
 - Articulated lorry
 - Folding ruler/chair/laptop
- C. If an object is rigid or inflexible, make it moveable or adaptable
 - Folding umbrella
 - Medical stent
- D. Increase the amount of free motion.
 - Use different stiffness of fibres in toothbrushes
 - Steering that adapts according to the road conditions



Figure 2 - Contradiction Matrix

Inventive Principle 4 – Trends of Evolution

Nowhere is the idea of simultaneous innovations in diverse industries as evident as in the Trends of Innovation. Systems do not evolve randomly; patterns exist and their evolution is predictable in a useful way. If you can identify where your technology or business system is, then you can predict the next stage.

An example is the Trend of Space Segmentation. Systems start as monolithic solid shapes, then move through hollow structures, multiple hollows, capillary structure and finally porous with active elements (see *Figure 3*).

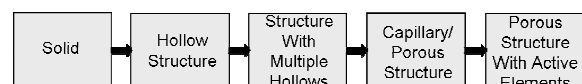


Figure 3 - Trend of Space Segmentation

Examples are chocolate bars, shoe soles, radiators and tyres.

By plotting where your product is with regards to the relevant trends, you can map how you compare with your competitors and provide a baseline for development (see Figure 4).

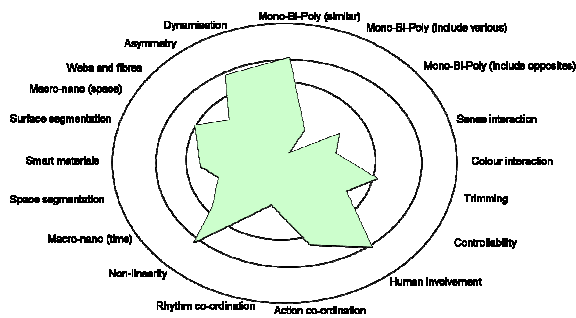


Figure 4 - Evolution Potential

Summary

TRIZ is a powerful method for managing innovation. It can be as simple or as complex as you want it to be and as the situation requires. You can pick up a tool and be adept at using it in a very short time, or you can spend years perfecting your approach.

The key message is that innovation is not solely for the very creative few – it is a process that can be learned and applied by all. TRIZ provides the framework and approach to let you achieve this easily.

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