Accelerate Innovation with TRIZ

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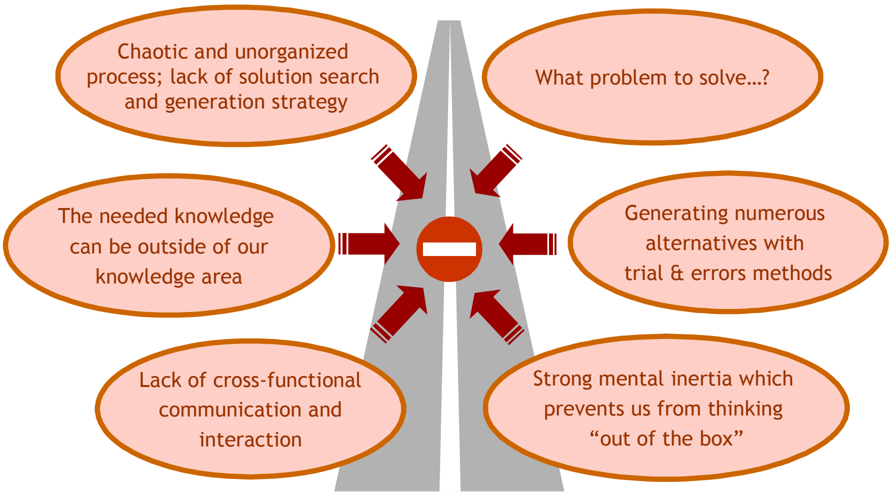
Today, evolution of science and technology has reached tremendous rate. Major breakthroughs in sciences, technology, medicine, and engineering make our everyday life more and more comfortable. Today it is nearly impossible to find an engineer who does not use complex mathematical tools for formal modeling of design products, CAD systems for modeling and drawing, electronic handbooks and libraries, and the Internet to find necessary data, information, and knowledge.

But what happens when we need to invent a radically new solution? To generate a new idea? To solve a problem when no known problem solving methods provide results? To predict and roadmap future generations of products and technologies? What tools and methods do we have to cope with these situations?

When it comes to producing new ideas, we still rely on thousands-years-old trials and errors method. It is good when a new brilliant and feasible idea is born quickly. But what price usually we have to pay for it? Wasting time, money and human resources. Can we afford this today, when competition is accelerating every day and capability to innovate becomes a crucial factor of survival? Certainly, not. But if there is anything that can help?



Common factors creating innovation roadblocks

Fortunately, the answer is "yes". To considerably improve innovative process and avoid costly trials and errors, leading innovators use Systematic Innovation: a scientifically-based methodology build on TRIZ. Relatively little known outside the former Soviet Union before the 1990th, TRIZ has quickly gained popularity at world-leading corporations and organizations, among which are DSM, Hitachi, Mitsubishi, Motorola, NASA, Procter & Gamble, Philips, Samsung, Siemens to name a few. This paper presents a brief overview of TRIZ and some its techniques with focus on technological applications of TRIZ.

TRIZ ORIGINS

TRIZ (a Russian abbreviation for the *Theory of Solving Inventive Problems*) was originated by the Russian scientist and engineer Genrich Altshuller. In 1948, Altshuller started massive studies of patent collections. His objective was to find out if inventive solutions were the result of chaotic and unorganized thinking or there were certain regularities and patterns which governed the process of creating new ideas and inventions.

After investigating approximately 400.000 patent descriptions, Altshuller found that only 0.3% of all patented solutions were really new, which meant that they used some newly discovered physical principle – such as the first radio receiver or the first film photo camera. The remaining 99.7% of inventions used some already known physical or technological principle but were different in its implementation (for instance, both a car and a conveyer belt may use the same principle: air cushion).

In addition, it appeared that a great number of inventions complied with a relatively small number of basic solution patterns. Therefore, Altshuller concluded that the vast majority of new inventive problems could be solved by using previous experience - if such experience is presented in explicit way, for instance in terms of principles and patterns. This discovery produced a tremendous impact on further studies which let to discovery the basic principles of invention.

More than thirty years of research resulted in revealing and understanding of origins of an inventive process, and formulation of general principles of inventive problem solving. At the same time, the first TRIZ techniques were developed. It also became clear that the evolution of technology is not a random process; instead it is governed by a number of trends and regularities.

TRIZ DISCOVERIES:

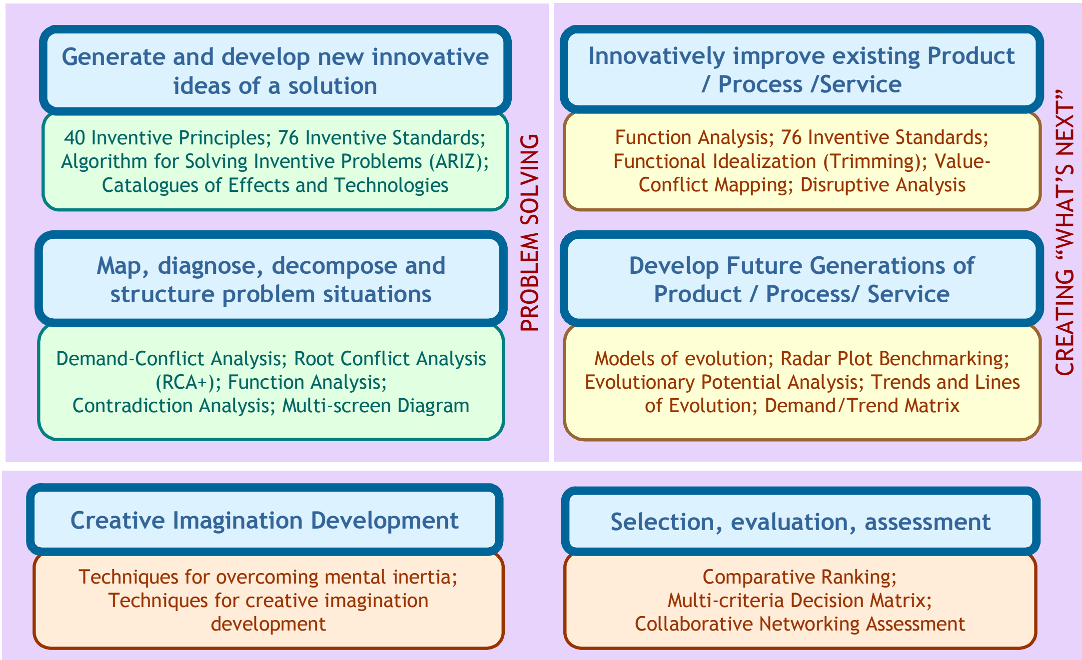
- 99.7% of inventions use already known solution principle
- Less than 0.3% are really pioneering inventions
- A breakthrough solution is a result of overcoming a contradiction
- Inventors and strong thinkers use common patterns
- Creative problem solving patterns are universal across different areas
- Evolution of man-made systems is governed by certain regularities and trends
- New innovative ideas can be produced in a systematic way by reusing previous experience and patterns of previous solutions

A main goal of Altshuller and his followers was to develop a method which would turn the inventive process to a clearly defined technology: from a problem to a solution without numerous trials and errors.

Later, many researchers and practitioners worldwide united efforts and largely extended Altshuller's approach with new methods, techniques, and tools. Today, a number of organizations and universities worldwide are involved to enhancing TRIZ techniques and putting them to the practical use.

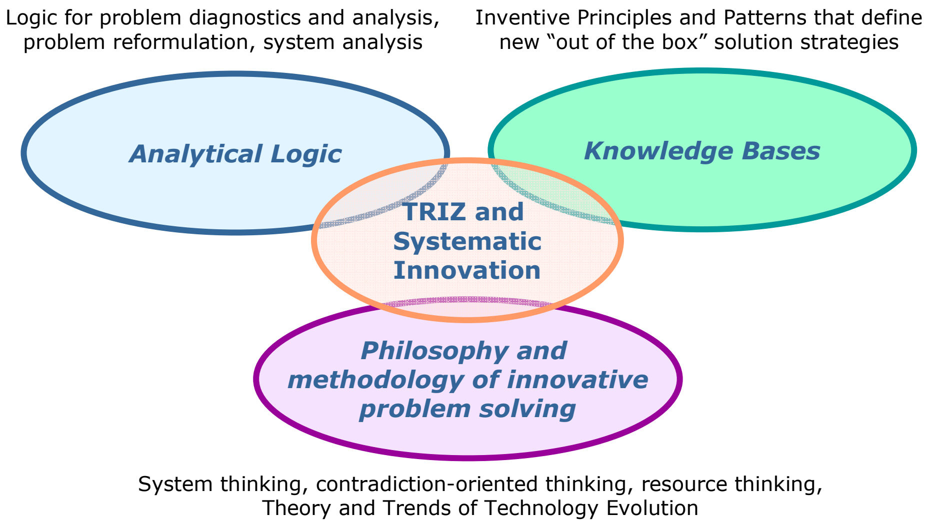
MODERN TRIZ

Modern TRIZ offers a number of practical techniques, which help to analyze existing products and situations, extract root problems, reveal potential opportunities for evolution, and generate new solution concepts in a systematic way. In addition, the use of the techniques and tools is organized in Systematic Innovation Process, which structures the use of the techniques and tools according to desired outcomes.



Techniques of modern TRIZ

In addition to the problem solving techniques and knowledge bases of inventive patterns, TRIZ introduces a new way of thinking: to solve most difficult problems, it is not just enough to use techniques, it is important to be capable of recognizing a problem as a part of system, to be able to see things at different system levels, to recognize links between system parts. In short, TRIZ is based on three pillars: analytical logic, knowledge bases, and a systematic way of thinking.



Modern Systematic Innovation is a large body of knowledge. It includes techniques for situation analysis and idea generation, such as Function Analysis, Root Conflict Analysis (RCA+), Evolutionary Potential Analysis, Inventive Principles, Patterns of standard solutions, Databases of physical, chemical and geometrical effects, Trends and Patterns of technology evolution and Algorithm of Solving Inventive Problems (also known as ARIZ), and so forth.

TRIZ and Systematic Innovation are not easy to master at advanced level since they form a large body of knowledge, and it takes considerable time to reach excellence with it. However, most of its techniques can be learned and applied independently, thus considerably simplifying both learning and implementation processes.

COMMON PATTERNS OF INVENTIONS

Let us have a look at how TRIZ works by comparing two problems.

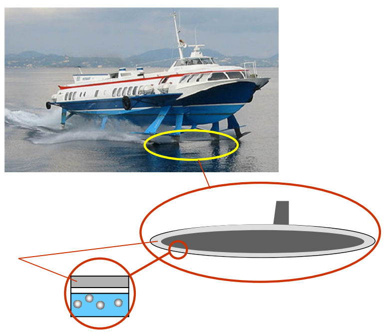
The first problem: how to protect a hydrofoil moving at a high speed from hydraulic cavitation, which results from collapsing air bubbles which destroy the metal surface of the foil?

And the second problem: how to prevent orange plantations from being eaten by apes if installing fences around the plantations would be too expensive?

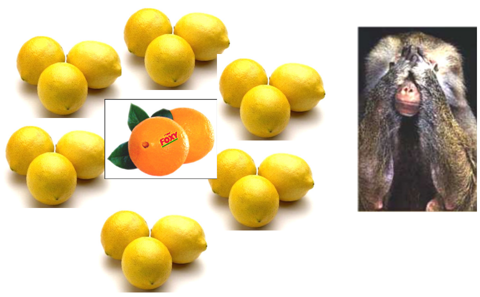
Are these problems similar? At a first glance, not at all.

However from the TRIZ point of view, they are similar, because both the problems result in identical problem patterns. In both cases, there are two objects that interact with each other, and the interaction results in a negative effect.

In the first situation, the water destroys the foil, in the second – an ape eats an orange. And there is no visible and simple way to improve the situations. To solve this type of problems, TRIZ recommends introducing a new component between the existing ones. Well, but how? We tried it, and it did not work – fences are still expensive. What did the best inventors do in such cases? Analysis of the best inventions showed that yes, we should introduce a new object between the two, but this new object has to be a "modification" of one of the two existing objects!

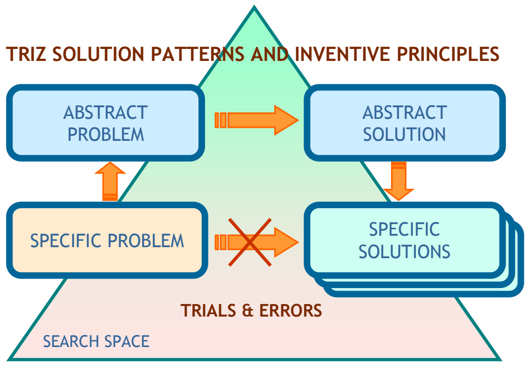


In TRIZ, the word "modification" is understood in broad terms. It can be a change of aggregate state of a substance, or a change of color, structure, etc. What can a modification of the water be? Ice. A refrigerator is installed inside the foil and freezes the water thus forming an ice layer over the foil surface. Now, the cavitations destroy the ice, which is constantly rebuilt.



What can be the "modification" of the orange? A lemon! The ape does not like the taste of the lemon so it was proposed to surround the orange plantations with lemon trees.

As seen, TRIZ suggests recommendations on solving new problems accordingly guidelines drawn from previous experience



of tackling similar problems in different areas of technology. Well-known psychological methods for activation of thinking (brainstorm, for instance) or traditional design methods aim at finding a specific solution to a specific problem. It is difficult – too much information has to be browsed and there is no guarantee that we move in a right direction. TRIZ organizes translation of the specific problem into abstract problem and then proposes to use a generic principle or a pattern, which is relevant to the type of the problem. As clear, by operating at the level of conceptual models, the search space is significantly reduced that makes it much easier to find the needed solution concept among the patterns TRIZ offers.

CONTRADICTIONS: GATES TO INVENTIONS

Another discovery of Altshuller was that every breakthrough inventive solution is a result of elimination of a contradiction. A contradiction arises when two mutually exclusive demands or requirements are put on the same object or a system. For example, the walls of a space shuttle have to be lightweight to decrease the mass of the shuttle when bringing it to the orbit. However, this cannot be done by simply decreasing the thickness of the walls due to the thermal impact when entering the Earth atmosphere. The problem is difficult due to the necessity to have two contrary values of the same parameter: according to the existing solutions, the walls have to be both heavyweight and lightweight at the same time.

When a problem solver faces a contradiction that cannot be solved by changing a product in a known way, this means that the engineer faces an inventive problem, and its solution usually resides outside a domain the product belongs to. One known method to solve problems with contradicting demands is to find a compromise between two conflicting parameters or values. But what to do if an optimal solution can not solve the problem to meet the demands? TRIZ suggests solving problems by eliminating the contradictions.

A comprehensive study of patent collections undertaken by TRIZ researchers and thorough tests of TRIZ within industries have proven the fact that if a new problem is represented in terms of a contradiction, a relevant TRIZ principle has to be used to find a way to eliminate the contradiction. The principle indicates how to eliminate the same type of the contradiction encountered in some area of technology before. The collection of TRIZ inventive principles is the most known and widely used TRIZ problem solving technique. Each principle in the collection is a guideline, which recommends a number of directions for solving a particular type of an inventive problem. There are 40 inventive principles in the collection, which are available in a systematic way according to a type of a contradiction that arises during attempts to solve the problem. Examples of the inventive principles are:

- ***Dynamics Principle*****:** Characteristics of the object (or external environment) should change such as to be optimal at each stage of operation; the object is to be divided into parts capable of movement relative to each other; if the object as a whole is immobile, to make it mobile or movable.
- ***Segmentation Principle*****:** Divide the object into independent parts; make the object such that it could be easily taken apart; increase the degree of the object's fragmentation (segmentation). Instead of non-fragmented objects, more fragmented objects can be used, as well as granules, powders, liquids, gases.

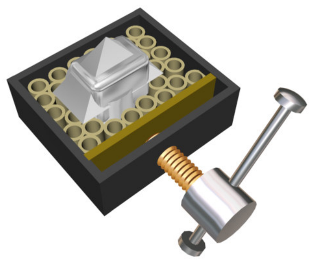
Access to the principles is provided through a matrix, which consists of 39 rows and columns. Positive effects that have to be achieved (so-called “generalized requirements”) are listed along the vertical axis while negative effects, which arise when attempting to achieve the positive effects, are listed along the horizontal axis. A selection of a pair of positive and negative effects indicates which principles should be used to solve the problem.

	what gets worse as a result of improvement				
	Speed	Force	Stress	.....	Stability
what to improve					
Speed		13,28,15,19	6,18,38,40	.....	28,33,1
Force	13,28,15		18, 21,11	.....	35,10,21
Stress	6, 35,36	36,35,21		.....	35, 2,40
.....	.....	....	....		.....
Stability	33,28	10,35,21	2,35,40	.....	

Altshuller Matrix for eliminating technical contradictions. Numbers indicate what principles have to be used: 1 - Segmentation; 2 – Taking out; 10 - Preliminary action; 13 - Other way round; etc.

For instance, a problem is that we need a device to hold an easily breakable part, which has a complex shape. If we use a traditional vise with clamping teeth, the contradiction is the following: to hold the part reliably (positive effect), we have to apply sufficient forces. However, the forces are distributed non-uniformly and the part can be damaged (negative effect).

To solve this type of contradictions TRIZ recommends using “Segmentation Principle” mentioned above. So we must segment the clamping teeth. It can be done by replacing the teeth with a chamber filled with small-sized elastic cylinders and to compress the cylinders by moving the chamber wall. As a result, the contradiction is eliminated: a part of almost any shape can be hold by such the device and the forces will be distributed uniformly.



While the Altshuller Matrix is a simplest technique to solve technical contradictions, modern TRIZ proposes a number of more powerful well-structured and systematic techniques how to analyze, extract and solve most difficult problems. Among them are Root-Conlfict Analysis (RCA+), Function Analysis, Algorithm of Solving Inventive Problems (ARIZ).

SCIENCE FOR INVENTORS

Sometimes, just to be capable of seeing things different is not enough. New breakthrough products often result from a synergy of non-ordinary view of a problem and knowledge of the latest scientific advances. TRIZ suggest to search for new principles by defining what function is needed and then finding which physical principle can deliver the function.

Studies of the patent collections indicated, that inventive solutions are often obtained by utilizing physical effects not used previously in a specific area of technology. Knowledge of natural phenomena often makes it possible to avoid the development of complex and unreliable designs. For instance, instead of a mechanical design including many parts for precise displacement of an object for a short distance, it is possible to apply the effect of thermal expansion to control the displacement.

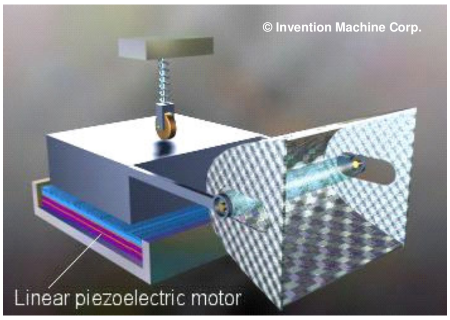
Finding a physical principle that would be capable of meeting a new design requirement is one of the most important tasks in the early phases of design. However, it is nearly impossible to use handbooks on physics or chemistry to search for principles for new products. The descriptions of natural phenomena available there present information on specific properties of the effects from a scientific point of view, and it is unclear how these properties can be used to deliver particular technical functions.

TRIZ Databases of the effects bridge a gap between technology and science. In TRIZ Catalogues, each natural phenomenon is identified with a number of technical functions that might be achieved on the basis of the phenomenon. The search for effect is possible through formulation of a problem in terms of a technical function. Each technical function indicates an operation that can be performed with respect to a physical object or field. Examples of the technical functions are "move a loose body" or "change density ", "generate heat field", and "accumulate energy".

Function	**Effects**
To separate mixtures	Electrical and magnetic separation. Centrifugal forces. Adsorption. Diffusion. Osmosis. Electroosmosis. Electrophoresis, …
To stabilize object	Electrical and magnetic fields. Fixation in fluids which change their density or viscosity when subjected to magnetic or electric fields (magnetic and electro-rheological liquids). Jet motion. Gyroscopic effect,

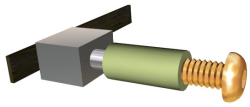
Fragment of the TRIZ Database of Scientific Effects

One of the first patents obtained with the use of TRIZ outside of the former ex-USSR was issued to Eastman Kodak. Engineers used the TRIZ Catalogue of effects to develop a new solution for camera's flash. The flash has to move precisely to change the angle of lightning. A traditional design includes a motor and mechanical transmission. It complicates the whole design and makes it difficult to precisely control the displacement. A newly patented solution uses piezoelectric effect and involves a piezoelectric linear motor, which is more reliable and easier to control.

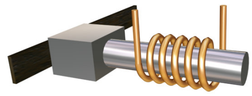


Another example illustrates the use the TRIZ Catalogues of physical effects. How to accurately control the distance between a magnetic head and a surface of a tape in a special high-performance digital tape recorder, where the gap should be different during different recording modes and a change must be produced very quickly?

In the TRIZ Database of Physical Effects, the function "to move a solid object" refers to several effects. One of the effects is the physical effect of magnetostriction: a change in the dimensions and shape of a solid body (made of a specific metal alloy) under changing the intensity of applied magnetic field. This effect is similar to the effect of thermal expansion, but it is caused by magnetic field rather than thermal field. The magnetic head is fixed to a magnetostrictive rod. A coil generating magnetic field is placed around the rod. A change of the magnetic field's intensity is used to compress and extend the rod exactly to the required distance between the head and the recording surface.



Picture A



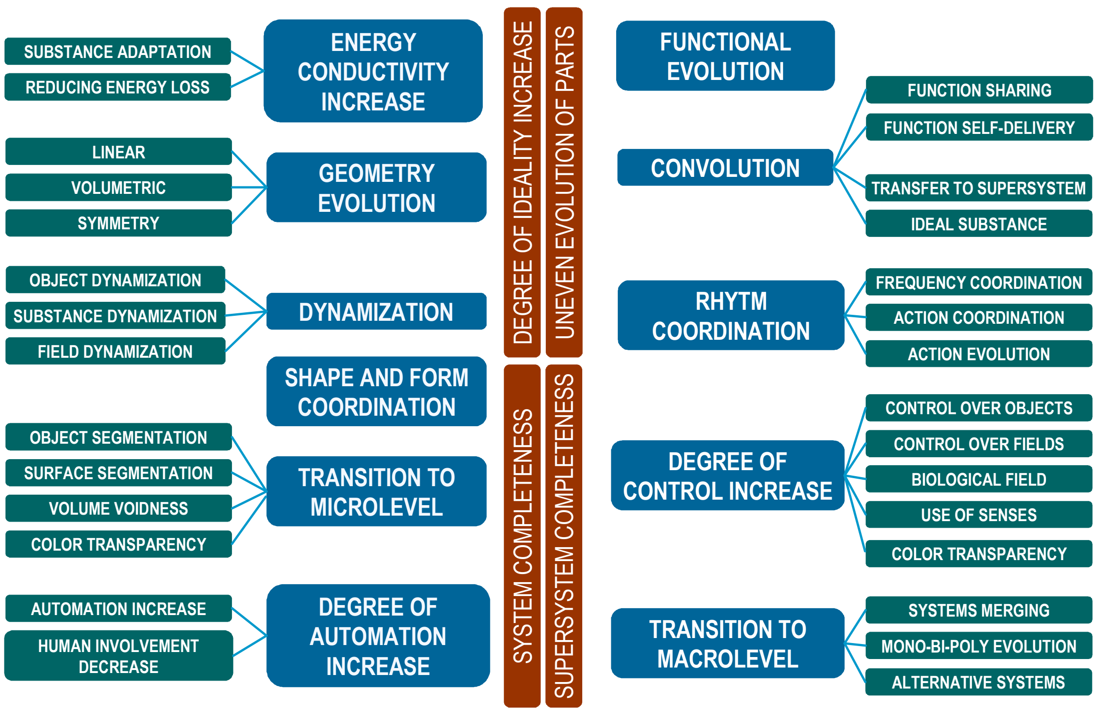
Picture B

Solving a problem with TRIZ Database of Physical Effects. Picture A: Old design with a screw, Picture B: new design with a magnetostrictive rod and a electromagnetic induction coil.

TRENDS OF TECHNOLOGY EVOLUTION

During his studies, Altshuller also discovered that the technology evolution is not a random process. Many years of studies revealed a number of general trends governing the technology evolution no matter what area the products belong to. The practical use of trends is possible through specific patterns. Every pattern indicates a specific line of evolution containing particular transitions between old and new structures of a system. The significance of knowing the trends of the technology evolution is that they can be used to estimate what phases of the evolution a system has passed. As a consequence, it is possible to foresee what changes the system will experience.

Currently the TRIZ trends of technology evolution are organized in a system, which relates different trends together and shows when and why one or another trend drives evolution of a specific system. The trends of technology evolution can be used as an independent tool to reveal evolutionary potential of technical systems and produce ideas for next generations of technical solutions.



TRIZ Technology Evolution Trends

One of the trends – evolution of systems by transitions to more dynamic structures ("Dynamization") is shown in the figure below.

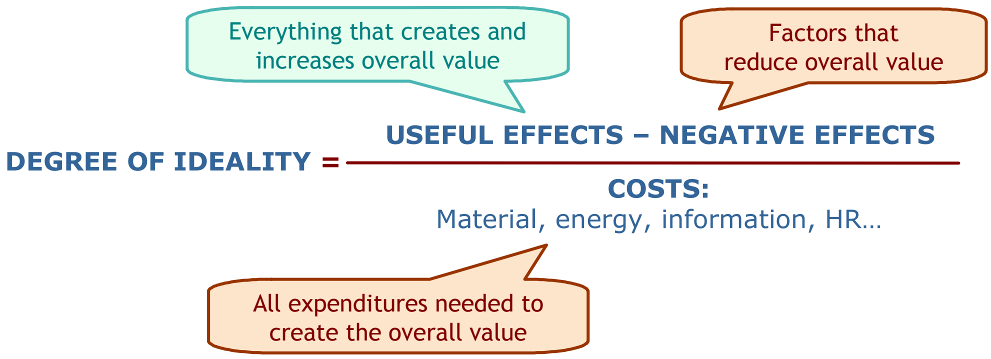
Evolution Stage	**Example**	**Illustration**
Solid object	Traditional mobile phone.	
Solid object divided into two segments with non-flexible link	Mobile phone with a sliding part which contains a microphone.	
Two segments with a flexible link	Flip-flop phone of two parts.	
Many segments with flexible links	Phone which is made as a wrist watch: its bracelet is made of segments, which contain different parts of the phone.	
Flexible object	A completely flexible phone that can be used as a wrist band.	

IDEALITY

One of the first discoveries made by Altshuller was that evolution of a majority of technical systems follows the so-called trend of "*Ideality Growth*". In other words, with each successful innovative improvement, systems tend to become more "ideal": they produce better functionality and higher performance, increase quality and robustness, whereas the material, energy, financial, and other types of resources needed to manufacture and provide lifecycles of these systems tend to decrease.

The trend plays a very important role to understand how and why systems and products evolve and define strategies of further improvements of systems and products.

As seen in the picture below, the overall degree of a system's ideality can be increased either by increasing the overall value of the system (functionality, performance, etc) or by reducing negative effects which reduce the overall system's value, or by decreasing resources needed to create and maintain the system's lifecycle. Really successful innovations can affect all three components together in a positive way.

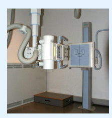
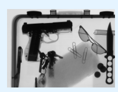
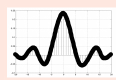
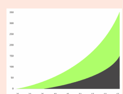


Increasing ideality does not always means reducing complexity. Just compare a mainframe computer 30 years ago and a modern desktop PC. The price of the desktop PC today cannot be even compared to what organizations had to pay 30 years ago for the mainframe, while its performance and functionality (positive effects) are many times higher. It is more reliable, generates less heat and noise, easier to recycle (negative effects), and costs much less to manufacture and maintain (costs).

FIVE LEVELS OF SOLUTIONS

Not all innovations are born equal. For instance, it would be difficult to compare an invention of a laser and adding an extra insulation layer to a coffee maker.

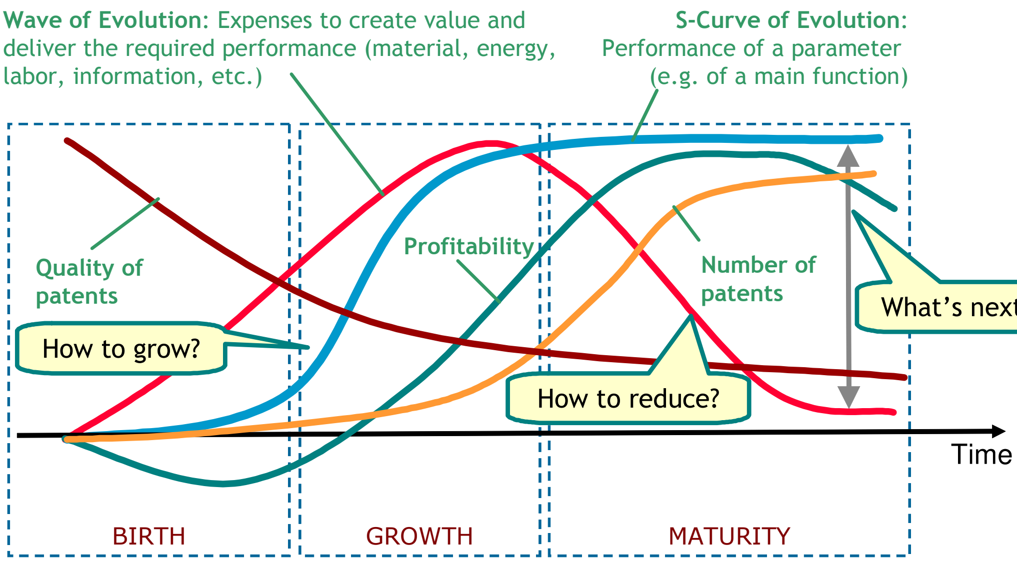
A table below shows how TRIZ distinguishes between different levels of solutions. Level 1 includes solutions which do not really require innovation: those are standard solutions which can be obtained with predefined algorithms. Level 2 already requires innovative thinking, but the resulting solutions are still simple modifications of existing products and systems. Level 3 is where a "real" innovation takes off: a certain system, product or a principle finds a radically new application area. Level 4 includes so-called "pioneering" inventions, where we create a radically new combination "function/principle" (usually drawn from scientific studies at level 5). And level 5 is formed by scientific discoveries which later can be implemented as new systems, products and technologies.

Level		Features	Examples	
Level 5: **Discovery**	GREEN OCEAN	Discovery of new scientific effects and phenomena, finding a new **principle**	X-ray discovery, radio waves discovery, coherent light discovery, etc.	
Level 4: **Pioneering Invention**	BLUE OCEAN	Creation of a radically new **"Function/Principle"** combination	X-Ray radiation (principle) is used to "see through" (function) a human body, thus launching a new technology area: X-Ray medical machines	
Level 3: **Innovation or Invention**		Extending a known **"Function/Principle"** combination to a new application area (**market**)	X-Ray technology is brought to other areas: non-destructive testing of constructions; X-Ray security systems in airports, etc.	
Level 2: **Qualitative System Change**	RED OCEAN	Qualitative Improvement within existing **"Function/ Principle/ Market"** combination	"Pulsating" mode of an X-Ray device to decrease energy consumption	
Level 1: **Quantitative System Change**		Quantitative Improvement: Simple variation of a value of a parameter or optimization	Increasing the power of X-Ray generator for testing larger objects	

As clear, a total number of solutions drops with each next level. There are many more solutions of level 2 than level 4. And as it was said in the beginning of this paper, solutions of level 4 represent only 0.3% of all known technical solutions.

MODELS OF EVOLUTION

In general, every system bypasses three phases of evolution before it experiences a radical innovation (solutions of level 3-5): birth, growth, and maturity. A main curve which depicts these phases is called "S-Curve of Evolution" (a thick blue line in the figure below). It shows how a performance of a main system parameter (which characterizes a certain function which is delivered by a new system) changes over time within the same basic principle of function delivery. When a system is just created, usually performance of the parameter is low. However the function became possible – and it matters above all at this stage.



Let us take, for instance, digital photography, where one of the main parameters is the image quality. If you remember the first digital cameras, the quality of images they produced was simply disastrous. However, a new function was born: capturing images digitally, and it was a breakthrough innovation. Then the next phase started: while all the efforts were put to make digital cameras produce images of good quality, with each innovation the images quality was rapidly growing. After 10 years of further evolution, even small cheap pocket cameras reached quality of good professional film cameras of the past. Now this parameter is in the "maturity" stage: we really do not need to increase the quality of images, thus the S-Curve becomes flat and we pay attention to innovating other parts of a digital camera or reducing costs of delivering its functions.

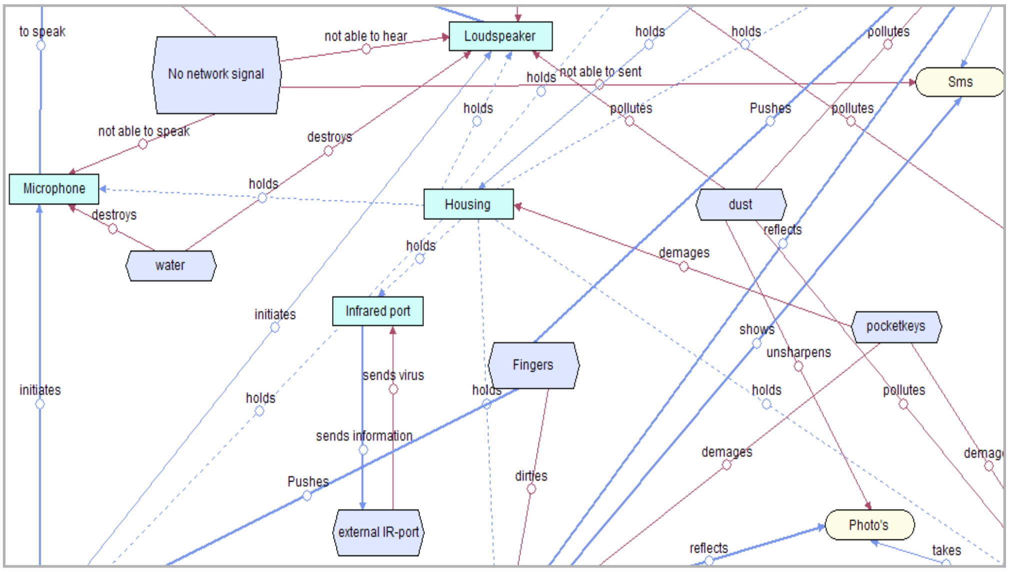
What happens when we exhaust the resources of evolution within a given working principle? The same what happened with film cameras – they were replaced by digital ones. Such transition usually means that we considerably boost functionality and performance of a system or a product by replacing a working principle behind delivering its main function which does not allow a system to develop further. Evolution of each technology can be represented as a timeline of S-curves, where each S-curve is based on a certain working principle.

ANALYTICAL TECHNIQUES

It is well known that solving inventive problems is difficult since in most cases they are not formulated correctly. Also, in many cases it is unclear what problem to solve. In order to deal with ill-defined initial situations, TRIZ introduces a number of tools which help us to deal with such situations.

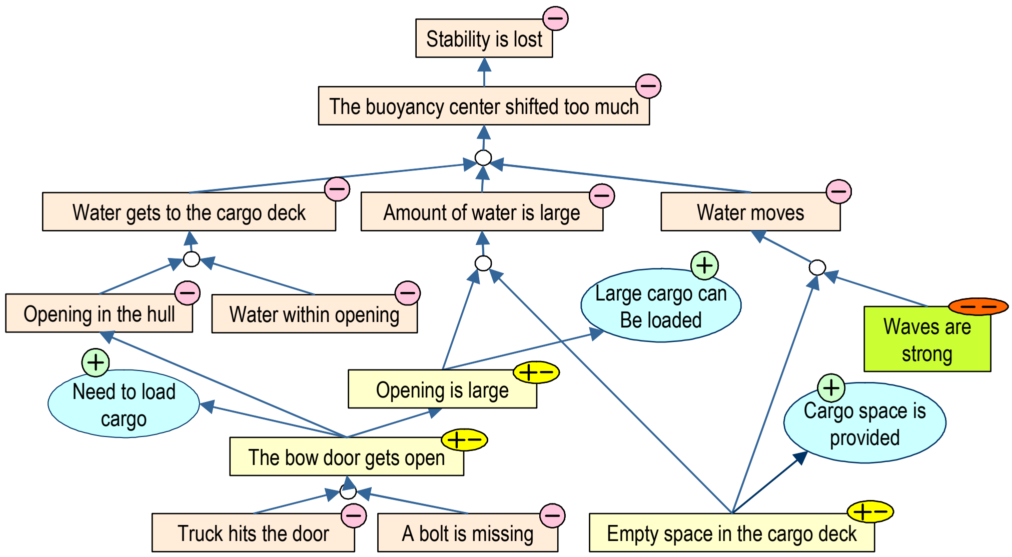
One of such tools is Function Analysis which decomposes systems and products to components and identifies problems in terms of undesired, insufficient, poorly controllable or harmful functional interactions between both system components and also components of so-called "supersystem", which is formed by everything that does not belong to the system or interacts with it. For instance, if a person takes a cup with hot coffee, the cup might be hot too and it can burn a hand of the person. In this case, a hand of a person is included to a function model and belongs to a supersystem of the system "cup with coffee".

TRIZ-based Function Analysis helps to quickly identify a range of function-related problems within a system and rank them according to their importance. It can be used not only for finding existing problems but for identifying resources to increase the degree of ideality of systems and products.



A fragment of Function Analysis diagram

Another tool, recently introduced to TRIZ is called "Root Conflict Analysis" (RCA+). Based on a combination of classical Root Cause Analysis, Theory of Constraints and TRIZ philosophy, RCA+ helps to "dissect" a general undesired effect to a number of causally related underlying negative causes and contradictions. Such process helps to understand deeper factors which contribute to the main negative effect and visualize all contradictions which create barriers preventing us from solving a problem in a straightforward way. Later, these contradictions can be directly solved with other TRIZ techniques.

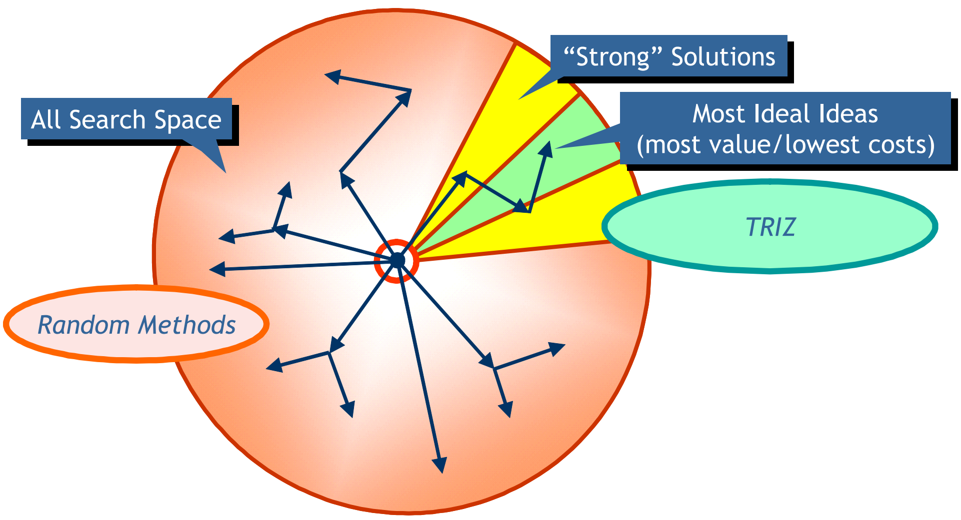


A fragment of Root Conflict Analysis (RCA+) diagram

PSYCHOLOGICAL INERTIA AND CREATIVITY

Some publications mention that TRIZ replaces or denies creativity. It is not true. Creativity is one of the essential factors of successful innovation. TRIZ operates at abstract level, and creativity is very important to translate TRIZ recommendations to real problems, systems, products. It is better to say that TRIZ provides guidelines for most effective use of creativity and guides creative search.

Modern innovation demands thinking out of the box and exploiting outside knowledge more and more often. Many innovative challenges, especially the most difficult ones require a huge number of trials and errors. As pointed by the Industrial Research Institute (Washington, DC), on average, one successful project requires 5.000 raw ideas to be generated. American Management Association reports that 94% of all innovative projects today fail to even pay back.



If we stand in the middle of a search space and start searching for a solution, how many directions we should explore to find a right direction without support? In other words, "we have to kiss too many frogs to find a princess". The more difficult a problem is, the more trials we have to make without any guarantee that a desired idea will be found.

When Altshuller started to work on TRIZ, his primary goal was to overcome this major disadvantage of chaotic and random idea generation. TRIZ provides navigation within the search space thus directing a problem solver towards a right segment with the highest chance to find a required solution.

Creativity is important to fight psychological inertia, which keeps us locked within existing solutions and ideas and does not let us see things differently. These barriers are difficult to overcome. Altshuller and his colleagues introduced a special section in TRIZ, which is called "*Creative Imagination Development*" and consists of a number of techniques which help us to develop our creative skills. Altshuller strongly believed that creative imagination can and should be developed to enable most effective use of TRIZ. In addition, special psychological "operators" were incorporated to some TRIZ techniques to reduce our mental inertia.

For instance, ARIZ, one of the most important TRIZ tools, introduced a stepwise algorithm of reformulating an initial problem by executing a number of procedures which reduce our psychological inertia and help to recognize "hidden" resources to solve the problem.

PRACTICAL VALUE OF TRIZ

As reported, today TRIZ and TRIZ software tools are used in about than 5000 companies and government organizations across the globe. In general, the use of TRIZ provides the following benefits:

1. Considerable increase of productivity when searching for new ideas and concepts to create new products or solve existing problems. As estimated by the European TRIZ Association experts on the basis of industrial case studies, these processes are usually accelerated 5-10 times. Sometimes, new solutions became only possible from using TRIZ.
2. Increasing the ratio "Useful ideas / useless ideas" during problem solving by providing immediate access to hundreds of unique innovative principles and thousands of scientific and technological principles stored in TRIZ knowledge bases.
3. Reducing risk of missing an important solution to a specific problem due to a broad range of generic patterns of inventive solutions offered by TRIZ.
4. Using the scientifically-based trends of technology evolution to reveal evolutionary potential of a technology or a product and select the right direction of evolution.
5. Leveraging intellectual capital of organizations via increasing a number of patented solutions of high quality.
6. Raising the degree of personal creativity index by training personnel to approach and solve inventive and innovative problems in a systematic way.

TRIZ is the most powerful and effective practical methodology of creating new ideas available today. However, TRIZ does not replace human creativity: instead, amplifies it and helps to move to the right direction. As proven during long-term studies, virtually everyone can invent and solve non-trivial problems with TRIZ.

TRIZ WORLDWIDE

Today, TRIZ is widely recognized as a leading method for innovation worldwide. Leading Japanese research organization, Mitsubishi Research Institute, which unites research efforts of 50 major Japanese corporations, invested US$ 14 mln to bring TRIZ and TRIZ-relates software to Japan. Motorola purchased 2000 packages of TRIZ software, while Unilever has recently released information about investing US$ 1.2 million to purchasing TRIZ software and using it as a major tool for achieving competitive leadership. In 1998, the TRIZ Association was formed in France, which involves such participants as Renault, Peugeot, EDF, Legrand. In 2000, the European TRIZ Association was established, with a global coordination group of 35 countries including representatives from Japan, South Korea, USA.

In 2004, Samsung Corporation recognized TRIZ as a best practice for innovation after a number of successful TRIZ projects, which resulted in total economic benefits of Euro 1.5 billion after performing over 200 TRIZ projects during three years. Intel, Boeing and Siemens recently announced corporate-wide TRIZ training and implementation programs.

Small and medium-sized companies benefit from using TRIZ as well. TRIZ helps to define and solve problems much faster and with relatively small efforts thus avoiding large investments to generate new working ideas and concepts.

SELECTED LITERATURE

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FURTHER INFORMATION

More publications on TRIZ from ICG T&C can be found at:

www.xtriz.com/publications.htm

A good starting point, the Online TRIZ Journal is available on the Internet: www.triz-journal.com

More information about TRIZ-related issues, products and services can be obtained from info@xtriz.com .

ABOUT THE AUTHOR

Valeri Souchkov has experience with training, facilitating and implementing Systematic Innovation worldwide since 1989. He pioneered promotion of TRIZ in Western Europe. He was a co-founder of Invention Machine Labs in 1989 (currently Invention Machine Corporation, a global leader in Knowledge-Based Innovation software), as well a co-founder of the European TRIZ association in 2000. Currently he heads ICG Training and Consulting, a company which delivers professional training and assistance in TRIZ and Systematic Innovation. Among his clients are Capgemini, DSM, LG Electronics, Philips, Posco, Siemens, Sensata, TNT, Unilever, as well as universities and government organizations. He can be reached at valeri@xtriz.com