Working with Innovative Principles of Science, Engineering, Business and Everyday Life: Expanding on Altshuller's 40 Principles

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Genrich Altshuller developed one of the primary sources of innovative principles between 1946 and 1973. Genrich's 40 principles were developed as a result of his research of patents and the history of technology. From Genrich's point of view these principles were foundational and today they have been expanded well beyond his original work to encompass all areas of science, engineering, business and even everyday life.

When conducting any type of creative or innovative work with the underlying principles from any field it is important to look beyond the words to more fully understand the intent of the author. In the case of Altshuller's work or any work developed in a language different than your own the challenge is compounded by translations. The early translations, although well intended, are often simplifications of the author's work. Frequently, the first translations are crude and gradually become refined by people who are the early adopters of the methods or principles. This process of refinement transitions the definitions of the principles for more practical use.

The following analysis of one of Altshuller's 40 principles (an extraction from ***40 Principles: Extended Edition*** by Genrich Altshuller with commentary by Dana W. Clarke, Sr. and published by the Technical Innovation Center) demonstrates the transition from an early translation of the principle to its interpretation for practical application.

Altshuller was very talented at selecting Russian words that could be easily visualized and were memorable. Principle #3 of Altshuller's 40 Principles, "принцип местного качества" has more meaning in Russian than Lev Shulyak's first English translation for this principle, "Local Quality". This principle like many innovative principles has more than one part, for example Principle #3, Local Quality, as translated by Lev includes: a) transition from homogeneous to heterogeneous structure of an object or outside environment (action); b) different parts of an object should carry out different functions; and c) each part of an object should be placed in conditions that are most favorable for its operation.

Fully accepting Lev's translation and moving to the next level of interpretation for practical application, the understanding can be simplified with the following description:

> *Change the characteristic of something (gas, liquid, solid or system) in a specific area (locally) in order to gain a required functionality. Note: The word "system" is an addition that allows this principle to be easily expanded to cover human and organizational situations.*

Beyond this we can begin to identify more information that will support how the principle can be used, for example:

The Principle may more appropriately be called "Optimal Resource", which came from a discussion with Len Kaplan, because when using this principle, the features are made non-uniform or optimal for each particular location and/or moment in time. Even this definition leaves room for improvement but for individuals who are actively involved in TRIZ this definition should have some value as an option to "Local Quality".

Generally, it is assumed that system characteristics are similar everywhere and all of the time. Although the assumption is simple and easy to imagine, it does not reflect reality. By applying the "Local Quality" principle, we consider improving or degrading the conditions of a characteristic in order to provide optimal function ability. For example, we have a large steel part that is subject to wear in a specific area. In order to reduce wear we could heat treat a specific area. Alternately, in order to machine a specific area – such as drilling a hole in the hard material – we could anneal (soften) the area of interest.

Thus we can achieve optimum functionality by varying conditions in different places, at different moments, for different features.

To apply the Local Quality principle to a given system, identify a specific area that requires different characteristics for optimal performance. Suggestions for altering conditions may include using different forms of energy, such as:

- Mechanical (burnishing, cold working)
- Thermal (heat treating, cryogenic treatment)
- Chemical (oxidizing)
- Electrical (electrostatic charge)
- Magnetic (selective magnetization)
- Electromagnetic (radiation treatment such as chemotherapy)

Next we need examples to reinforce the definitions. Altshuller's work outwardly appeared to be focused on science and technology but there was much more behind it. When reading the definitions you need to look beyond the specific terminology and technical examples to discover that there is value in applying these principles in any area of life. The following examples demonstrate the flexibility of this principle.

Example of Principle #3, Local Quality

- A polished surface reduces friction. Texturing a surface increases friction.
- A polished surface reflects light. A textured surface changes the coefficient of light refraction.
- Apply psychology locally – a pleasant and helpful receptionist in the lobby of a company creates a positive first impression of the company (at a particular location). Each time the client returns the receptionist reinforces that image (in time).

- A business may release a press release to focus attention on a very successful aspect of the business and away from a more problematic aspect. This same press release may be intended to shift pressure on a competitor in the larger marketplace. This principle may be applied to whatever scales the system demands.
- Repeatedly applying a load to the tricep muscles that is out of proportion to the biceps allows for stronger punches in a martial artist. Appling repeated loads to the biceps out of proportion to the triceps develops sensational beach muscles – looks good, but not as useful for fighting.
- The formation of ice on a pond in winter is a natural event that allows a person to stand or ice skate on a locally hardened area – the surface.

References:
You can learn more about how to apply Altshuller's 40 Principles from the new ***40 Principles: Extended Edition*** by Genrich Altshuller with commentary by Dana W. Clarke, Sr., published by the Technical Innovation Center (make sure you get the Extended Edition available from the Altshuller Institute at www.aitriz.org.)
You can also get a monthly dose of Dana's writings on many more innovative principles for business, science and engineering by subscribing to his Innovation Magic newsletter at www.aia-consulting.com.

About the author: Today, Dana is President/CEO of Applied Innovation Alliance, which is involved in the development of innovation strategies for business leaders. In March of 2001, Dana W. Clarke, Sr. became the first natural-born U.S. citizen to be certified by the International Association of TRIZ. Dana is a student of and had the unique opportunity of working with TRIZ Masters Boris Zlotin (who originally certified him as a TRIZ Specialist in 1995), Alla Zusman, Victor Fey, Vladimir Gerasimov and Kiril Sklobovski. Beyond this he has worked with TRIZ Specialists – Len Kaplan, Peter Ulan, Sergy Malkin, Vladimir Proseanic, Svetlana Visnepolschi, Valeriy Prushinskiy, Gafur Zainiev, and Inlika Zainieva. Between 1997 and 2001, under the direction of Boris Zlotin and Alla Zusman, Dana was responsible for the training of 38 TRIZ Specialists from around the world and was responsible for training hundreds of individuals in the principles of TRIZ. Dana is the author of "***TRIZ through the Eyes of an American TRIZ Specialist***" and has authored new materials to complement Genrich Altshuller's' book "***40 Principles: Extended Edition***", which is being released in April 2005.