The Main Postulates of TRIZ

Introduction

The foundation of contemporary TRIZ includes a set of postulates revealed through extensive study of the history of evolution of various systems of different scale:

- Specific technological systems and entire technologies
- Specific sciences and science as a whole
- Various social groups and societies
- Arts, etc.

Knowledge in biological and social evolutions and synergetics were used as well; TRIZ methods and approaches were also applied.

The following postulates relate primarily to technological systems. Obviously, some of them might have more general application other than to artificial (man-made) systems; this will be addressed in future publications.

Postulate 1. Patterns of Evolution

The majority of manmade systems evolve according to the following pre-determined patterns, rather than randomly. These patterns can be revealed through the study of the history of evolution of various systems, and used to accelerate system evolution, as opposed to waiting for the system to evolve "naturally."

Derivatives:

1. Based on the study of the history of evolution, typical "correct" evolutionary steps can be identified that represent the Lines of Evolution; typical evolutionary mistakes can be identified as well.

2. Prediction of the future can be replaced by the identification of pre-determined future steps on applicable Lines of Evolution. On the basis of this information, decisions for undertaking these steps can be made rather than relying on guess-work.

3. Typical mistakes can be avoided in the future.

Postulate 2. The Driving Force of Evolution

The majority of existing man-made systems evolve to satisfy customer requirements and needs (either spelled out or unrecognized). In general, customers want more functionality and quality at reduced cost and with fewer harmful effects.

Derivatives:

1. A system evolves towards greater Ideality:

$$I = \frac{U}{H}$$

Where I = Degree of Ideality
U = Sum of useful functions
H = Sum of all harmful functions (effects)

2. Any manmade system can be improved in the direction of enhanced quality and useful functions and/or in the direction of reduced cost and other harmful effects.

3. Not every problem can be solved, however, every situation can be improved.

4. A system's evolution depends on the subjective human estimation of what is useful and what is not (where, when, under which circumstances, etc.)

Postulate 3. Generation of change combined with selection

Any technological system evolves in such a way that, first, various ideas are generated that result in system changes or in new systems being built; then, a selection process is applied by which the best system for satisfying the requirements are chosen if, in fact, they represent an increase in the system's ideality. The main selection factor is market response, which in turn provides the financing that is crucial to system development.

Two types of selections – positive and negative – impact a system's evolution:

- Positive selection – works in healthy economic situations to favor systems capable of effectively capitalizing on available resources and that can be quickly spread throughout the industry or market
- Negative selection – works during times of economic depression to favor systems capable of surviving with minimum resource-consumption and which are well protected from the negative impacts of the environment.

Postulate 4. Evolution at the expense of resources

A system's evolution proceeds via the consumption of resources existing in the system itself, its neighboring systems, and/or the system environment. Each evolutionary step generates new resources that can be used to further develop the given system, as well as other systems. However, negative resources that can originate undesirable effects might also result from the process of evolution.

In the process of a system's evolution, resource consumption makes it more and more difficult to mobilize resources, therefore, a number of sequential transitions to different kinds of resources occur. These transitions involve the following resources:

- From readily-available to derived resources
- From simple resources to "smart" or intellectual resources (including inventions)

Derivatives:

1. The initial evolutionary steps involve mostly simple, obvious and easily-accessible resources. Complex, derived and hidden resources are involved later.

2. New generations of products or processes usually appear when a new type of resource has been discovered (frequently, resources of material structure).

Postulate 5. Excessiveness of an existing system

The majority of existing technological systems have redundant resources, that is, they have more resources than are necessary to perform their intended function.

Derivatives:

Nearly any "untouched" system may be forced to work more effectively, perform additional functions, etc.

Postulate 6. Co-evolution of different systems

Many technological systems are connected with one another; the strength of their connections increases with the process of evolution.

Derivatives:

1. Different technological systems create resources for one another.
2. Different technological systems cause limitations for one another.

3. Changes in one technological system can directly or indirectly lead to changes in other, connected systems.
4. Feedback relationships might occur between different systems as they evolve, as follows:
   - Positive or reinforcing connections that accelerate the evolution of the various systems involved
   - Negative (stabilizing) relationships, when the evolution of one system holds back the evolution of others.

Postulate 7. Co-evolution of systems belonging to different hierarchical levels

Systems belonging to deferent hierarchical levels (a system and its sub-systems, or a system and its super-system(s)) are tightly connected in their evolution and evolve in coordination with one another (co-evolution).

Derivatives:

1. A super-system can "force" its system (sub-systems) to evolve according to its own lines rather than allowing them to follow their own lines.
2. Limitations that occur in a small sub-system might hold back the evolution of the entire system.

Postulate 8. Short- versus long-term forecasting

A system's short-term evolution (improvement) depends primarily on this system's inherent resources. Long-term development, including the emergence of new generations, breakthroughs, etc., depends on the evolution of the overall technology and/or market rather than on the given system's particulars and resources.

Derivatives:

1. Short-term forecasting based on the given system's trends and on the opinions of experts might be sufficiently accurate.

2. Long-term forecasting for a given system must be based on an analysis of the evolutionary trends of the overall technology and market.

   Note. This postulate might explain why many forecasting techniques offered in the 1950s through the 1970s were ineffective. Most of them assumed that the forecast should be made by those who were Subject Matter Experts in the system, and should be based on information collected about this particular system's evolution. However, according to this postulate, much wider expertise is required. Since the possibility of involving experts in all applicable areas of human life is limited, to generate a reliable forecast, universal and general Patterns/Lines of Evolution must be used to accumulate the knowledge of all mankind and to structure and organized convenient tools.

Postulate 9. There are a limited number of ways to perform a function

A function can be realized in a limited number of distinguishable ways based on the utilization of known resources. New types of resources might arrive as a result of a discovery.

Derivatives:

1. It is theoretically possible to exhaust (or nearly exhaust) all possible ways of performing a given function.
2. Based on #1, insurmountable patent fences can be developed.
3. In fields where many professionals have been working for a long time and in the presence of competitive pressure, the possibility of further evolution might be nearly exhausted. Usually, this takes between 20 to 50 years.

   Note. TRIZ cannot provide more viable solutions than are actually possible. It can help, however, in obtaining a nearly exhaustive set of solutions in a relatively short time frame (from one week to several months, depending on the system complexity and the number of TRIZ professional involved). This advantage might be crucial when key decisions must be made promptly.

Postulate 10. Alternatives in evolution

There is more than one, though still a limited amount, of fairly equal ways (directions) by which a given system can be evolved from its current position to the next one, based on involving different types of resources. The "winner" is usually the one that starts first and attracts the majority of financial and human resources.

Derivatives:

1. It is possible to direct the evolution of a system by managing its resources.
2. If a specific problem has not been solved to date, there is no guarantee that a solution will be found using the Ideation /TRIZ methodology. However, if at least one solution to the given problem has been developed, the methodology can help identify multiple solutions that should be analyzed, and the best one(s) selected from among them.
3. Any single patented solution can be circumvented.

Postulate 11. Standard ways to solve problems

Common ways to solve problems or improve a system, based on the Patterns of Evolution, exist. These ways can be revealed via analysis of the history of inventions, allowing innovation knowledge to be collected and transferred.