REVIEW OF TRIZTHEORY

Attalah Mohamed AlatawiMohdZuriGhaniAswatiHamzah*

Abstract

As discussed above, TRIZ program is a flexible, dynamic,This is an analytical tool that incorporates most basic concepts of TRIZ into a system of problem solving. It is composed of a sequence of procedures for defining the problem and deriving proposed solutions, This paper shows a glance at the TRIZ theory and present 10 principles in TRIZ program speralion, preliminary, blessing, copying, discarding, segmentation, nesting, inversion, color changes, phase transitions.

Keywords: TRIZ Theory, TRIZ Program

Introduction

One of the most recognized thinking theories in the world is the TRIZ. Since its creation, TRIZ theory is constantly evolving, and there is a yearly conference that addresses the continuous development of TRIZ theory (www. aiTRIZ. org). Altshuller (1945) the founder of the theory, identified and codified principles that enabled people to invent, and discovered that such principles are the basic, universal drives for creative thinking. Altshuller(1979) also came to the conclusion that if these principles could be could be taught to people to make the process of invention more predictable and to enhance creative thinking (TRIZ journal, 2013). According to Altshuller(1968) invention is nothing more than the removal of technical contradiction with the assistance of a set of contestant principles. He emphasized that one does not have to be born an inventor in order to be a good inventor (Lerner, 1991).

Several of the TRIZ principles, when used in isolation can be implemented as part of the brainstorming method in order to create a large number of ideas and solutions. However, the

* University Science Malaysia, Penang, Malaysia

philosophy of TRIZ is to focus the problem solving effort into areas most likely to be successful, rather than generating large quantities of ideas (TRIZ journal, 2013), and he criticized the trial and error method that are normally used to make discoveries. These definite road map and concise target of TRIZ principles makes it an attractive model for implementing in the development of thinking processes, particularly in the area of critical thinking and problem solving. Although TRIZ theory was originally modeled for technical problems, the flexibility and universality of TRIZ theory makes it a potential foundation for non-technical and educational purposes.

Bowyer (2008) confirmed the effectiveness of the TRIZ principles in solving non-technical problems by non-specialized individuals. In addition, Bowyer's research supported the argument that TRIZ principles can improve certain aspects of the individuals' critical thinking abilities. Therefore, and because critical thinking processes precedes problem solving, TRIZ principles can improve the problem solving ability of its participants. In addition, the dynamicity of TRIZ principles allow them to be an effective and efficient tool for training and conducting group problem-solving exercises.

TRIZ theory

1. The rise and development of TRIZ theory

TRIZ theory is also known as "the creative solutions to problems", and is considered one of the modern theories in the Arabic region. TRIZ theory is predicted to have a large impact in the Arabic region similar to the success that TRIZ theory created in the western countries. Many of the resources, including internet websites testify to the importance and significance of TRIZ theory (Abu Jado, 2005).

The TRIZ theory was developed by the Russian scholar, Henry Altshuller, who was born in 1926. Altshuller worked as a patent officer in the Russian marine, and in 1946 he started the development of the TRIZ theory and published many research articles and authored 14 books about it (Rantaneen, 1999).

Alshuller noticed the myriad of creative thinking abilities in the patent submissions that he screened. Alshuller and his colleagues in the patent office decided to accumulate and analyze the

information in 40,000 patent submissions; since these can represent a sample on the creative solutions to problems. After the analysis of the 40,000 patent submissions, Altshuller and his colleagues concluded that all the innovation depicted in the patents are a result of a systematic process, and are not random nor disorganized. Altshuller further concluded that many of the patent submissions followed specific creative thinking processes, which share similar stages and philosophies. Altshuller then, compiled his findings to 40 principles TRIZ theory. TRIZ theory can be used to train individuals on creative thinking, and also can be used to achieve creative solutions to many philanthropic challenges (Abu Jado).

Realizing the importance of TRIZ theory, Japan took the initiative of educating its people about it. Japan spent about $ 50,000 for the translation of TRIZ theory and conducted 2,500 TRIZ training workshops in one year (2008-2009). Similarly, the education ministry in France took on the responsibility of training 17,000 teachers as part of its national educational reform mission. TRIZ theory became well known in more than 28 countries, and its teaching is implemented in more than 42 universities and many corporations (Abu Jado, 2005). In general, TRIZ theory is the leader of creative thinking theories in the western countries (Pahi, 2002) as the main focus of TRIZ theory is creative thinking and innovative problem solving.

2. The classical TRIZ theory

The initial TRIZ theory (1946) was comprised of 35 creative thinking strategies, and between 1968 -1971, Alshuller, added 5 more creative thinking strategies to TRIZ theory, thus TRIZ theory contained a total of forty principles. The forty strategies were used as is and without any development or modification until 1985 (Zusman et al, 1999).

3. The Modern TRIZ Theory

The updating of TRIZ theory spanned five years (1985-1990) and was conclusively confined to Russia. The Russian developers of TRIZ theory aimed at implementing TRIZ theory to individual and institutions, with regards to technological and non-technological aspects. The migration of the Russian outside of the Soviet Union starting in 1990, marked the spread of TRIZ theory to United States of America, Japan, Germany, and other countries (Rantaneen, 1990).

4. TRIZ principles

TRIZ (Gadd, 2011) consists of forty (40) Inventive Principles – the Contradiction Matrix and Extraction Principles. The technical and physical contradictions can be solved by implementing the 40 principles. The set of the forty principles is a major tool for problem solving in TRIZ and its usage is quite easy and effective (Gadd, 2011).

Table 1

The forty principles of TRIZ theory (faqeeh, A2005).

1. Segmentation	11. Cushion inadvance	20. Continuity of Useful Action	30. Flexible membranes
2. Extraction	12. Equipotentiality	21. Rushing Through	31. Porous materials
3. Local quality	13. The Other Way Around	22. Blessing in Disguise	32. Colour change
4. Asymmetry	14. Curvature increase	23. Feedback	33. Homogeneity
5. Merging	15. Dynamics	24. Intermediary	34. Discarding and Recovering
6. Universality	16. Partial or excessive actions	25. Self-service	36. Phase transition
7. Universality	17. Another dimension	26. Copying	37. Thermal Expansion
8. Weight Compensation	18. Mechanical Vibration	27. Cheap Disposables	38. Accelerated Oxidation
9. Prior Counteraction	19. Periodic action	28. Replace Mechanical System	39. Inert atmosphere
10. Prior action	20. Continuity of Useful Action	29. Pneumatics and Hydraulics	40. Composite Materials

the principlesThe strategies, as defined by Souchcoy (1999) are:

1. The Segmentation Principle

This Principle refers to the possibility of solving problems by splitting the system into several parts, each is independent from the other .But if the system is already divided ,splitting it to more parts can make problem solving become possible.

The recommendations for the dividing principle are:

a) Divide the main system/problem to several parts to ease Extractions and combinations.

b) Divide the main system to several parts to enable the removal and retrieval of some of the parts as needed.

c) Divide each part of the system to sub-parts such as: Liquid; gas; solid → powder →particles.

d) Increase the degree of the system's Segmentation.

2. The Extraction Principle

The possibility of solving problems by selecting ingredients that work well and work to keep them alive, and to identify the harmful components or parts or those that do not work well for separation and disposal.

The Extraction principle recommendations are:

a) Identification and maintaining of the system's parts that work well, and identification and elimination of the system's parts that are not working properly and.

b) If part of the system prohibited completing the desired outcome, it should be isolated and eliminated.

c) Identification of the most important part in the system, and the development of a new system that includes only this particular part of the system.

3. The Merging Principle

Indicates the spatial and temporal link between systems that result in similar or contiguous operations and the collection of things or similar or identical components that perform functions and balanced operations so that they are close or contiguous in terms of time and place.

The Merging principle recommends:

a) Combine the analogous parts spatially

b) Combine the analogous parts temporally.

c) Combine the implementation of connected parts simultaneously.

4. The Nesting Principle

This strategy usually includes measures contrary to those used in solving problems. If things are fixes ,we make them move, and if they are moving ,we make them become fixed.

The inclusion principle recommends:

a) Include one part within another, or put one part in the interior of another.

b) Insert one part in another part of the system

c) Increase the number of overlapped parts in the system

d) Show the activities of the operation when needed, and do not show the activities when not needed.

5. The Inversion Principe

Making the system able to serve itself through fulfilling supportive functions (maintenance, difference treatment and the use of wasted resources).

The inversion principle recommends:

a) Invert the stable and dynamic parts of the system

b) Replace parts of the system with other parts that have opposite characteristics -for example, white with black; full with empty.

c) Invert a part of the system top to bottom.

d) Invert the desired outcome of the system.

6. Blessing in Disguise Principle

Points at changing the color of the thing or its external environment.

The Blessing in Disguise principle recommends

a) Employ the parts of the system that responds negatively to achieve positive outcomes.

b) Maximize the negative effect in such a way that makes it unable to portray the negative effect on the system or its surrounding.

c) Eliminate a negative part by merging it with another part that cancels its negative effect.

7. Changing Color and Transparency Principle

Containment something in something else which in turn can be contained in something third, and so on, or by passing a certain something in the cavity of something else.

The changing color and transparency principle recommends

a) Change the color of the outcome or the color of its surrounding.

b) Change the transparency of the system or the transparency of its surroundings.

c) Use glowing colors

8. Universality Principle

Making the system capable of several functions or tasks or make every part of the system able to carry out the largest number of job performance and thus less need for other platforms.

The Universality principle recommends:

Enabling each part of the system to do more than its own task, thus requiring less systems.

9. The Copying Principle

Using items or harmful effects on the environment to get the positive effects.

The copying principle recommends:

a) Use a simple, economy copy of the system instead of the original complicated, pricy system.

b) Using a photo to replace the system, by which it can be magnified or shrunk according to the arising needs.

10. The Self -Service Principal

This strategy refers to the possibility of solving problems using a simple copy instead of using complicated things and replacing a thing by its copy.

The principal of self-service recommends

a) Enabling the system to serve itself by doing additional support tasks.

b) Enabling the system to serve itself by adapting and self-correction.

c) Employ the available and consumed resources within the system to achieve the desired self-service.

Reference

- Abdeen, S. (2014). Theory Concurrent thinking. *Life science journals,11(12)* , USA.
- Abdeen, S. (2015). Think out the box with Concurrent thinking theory. *IPCiRE2015*,USM.
- Al-faqeeh, A. (2005). TRIZ theory and its importance as an enrichment program for the gifted and talented student and its role in increasing their creativity. The Center for Talent Care, Jeddah, KSA.
- Altshuller, G. 1984. Creativity As an Exact Science: The Theory of the Solution of Inventive Problems, New York, Gordon and Breach Science Publishing.
- Altshuller, G. 1999. The Innovation Algorithm, Worcester MA, Technical Innovation Centerinc.
- Bowyer, D. (2008). Evaluation of the effectiveness of TRIZ concepts in non-technical problem-solving utilizing a problem solving guide. ProQuest.
- Lerner, L. (1991). GenrichAltshuller: Father of TRIZ. Available: http://www.aiTRIZ.org/articles/altshuller.pdf.
- Souchkov, V. (1997). Accelerate innovation with TRIZ. Retrieved from http://www.xTRIZ.com/publications/AccelerateInnovationWithTRIZ.pdf
- TRIZ Journal, "What is TRIZ?". [Online]. Available**:**http://www.TRIZ-journal.com/whatisTRIZ_orig.htm.(Accessed: 4 September, 2013).