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A review of TRIZ, and its benefits and challenges in practice

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ABSTRACT

TRIZ (the theory of inventive problem solving) has been promoted by several enthusiasts as a systematic methodology or toolkit that provides a logical approach to developing creativity for innovation and inventive problem solving.

The methodology, which emerged from Russia in the 1960s, has spread to over 35 countries across the world. It is now being taught in several universities and it has been applied by a number of global organisations who have found it particularly useful for spurring new product development. However, while its popularity and attractiveness appear to be on a steady increase, there are practical issues which make the use of TRIZ in practice particularly challenging. These practical difficulties have largely been neglected by TRIZ literature.

This paper takes a step away from conventional TRIZ literature, by exploring not just the benefits associated with TRIZ knowledge, but the challenges associated with its acquisition and application based on practical experience. Through a survey, first-hand information is collected from people who have tried (successfully and unsuccessfully) to understand and apply the methodology. The challenges recorded cut across a number of issues, ranging from the complex nature of the methodology to underlying organisational and cultural issues which hinder its understanding and application. Another contribution of this paper, potentially useful for TRIZ beginners, is the indication of what tools among the several contained in the TRIZ toolkit would be most useful to learn first, based on their observed degree of usage by the survey respondents.

Contents

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1. Introduction

TRIZ comes from the Russian phrase “teorija rezhenija izobretatelskih zadach”, which means the “theory of inventive problem solving”(Rantanen and Domb, 2008). It was developed by Genrich Altshuller (a Russian scientist and engineer, 1926–1998) and his colleagues, who studied about 400,000 technology patents and from them drew out certain regularities and basic patterns which governed the processes of solving problems, creating new ideas and innovation. TRIZ was developed originally for technology-related problems. However, it has seen application in various other fields.

In this methods review TRIZ is considered and its main concepts and methods are pointed out. In addition, the manner in which the methodology has propagated and has been applied in various fields, including non-technical fields, is outlined. A section of this method review is devoted to examining the experiences of people who have actually applied TRIZ. These experiences are gathered from a survey of TRIZ professionals and enthusiasts. The benefits they gained and challenges they faced while applying TRIZ, and the recommendations they offer for its improvement are pointed out making it much broader and informative than a typical review.

2. What is TRIZ?

Contemporary descriptions of TRIZ indicate that it extends beyond being merely a theory or a set of principles as its name suggests. TRIZ is a knowledge-based systematic methodology of inventive problem solving (Savranksy, 2000). Fey and Rivin (2005) described TRIZ as a methodology for the effective development of new [technical] systems, in addition to it being a set of principles that describe how technologies and systems evolve. Also, it has been described by Gadd (2011) as a toolkit consisting of methods which cover all aspects of problem understanding and solving. This toolkit is regarded by some as the most comprehensive, systematically organised for invention and creative thinking methodology known to man (Livotov, 2008).

TRIZ rests on the premise that technology evolution and the way to invention is not a random process, but is predictable and governed by certain laws (Souchkov, 1997; Eversheim, 2009). It is on analytical logic and a systematic way of thinking (Souchkov, 1997; Savranksy, 2000). This systematic approach provides an overall structure for the application of the collection of TRIZ tools and techniques.

Even though the TRIZ has been described in various ways – a methodology, a toolkit, a science (Barry et al., 2006), a philosophy (Nakagawa, 2001), etc., and this has the potential of creating confusion on what it actually is, what it is said to be capable of achieving remains unanimously clear. It provides a systematic approach for finding solutions to technical problems and innovating technical systems.

3. What does TRIZ offer and how does it work?

TRIZ possesses considerable advantage over other methods applied to problem solving and innovation. Methods such as brainstorming, mind mapping, lateral thinking, morphological analysis, etc., have the ability to identify or uncover a problem and its root cause, but lack the capability to actually point out solutions to the problem. On the other hand, TRIZ helps to identify problems and offers direct solutions to them, along with confidence that most (if not all) possible new solutions to the problem have been considered (Gadd, 2011).

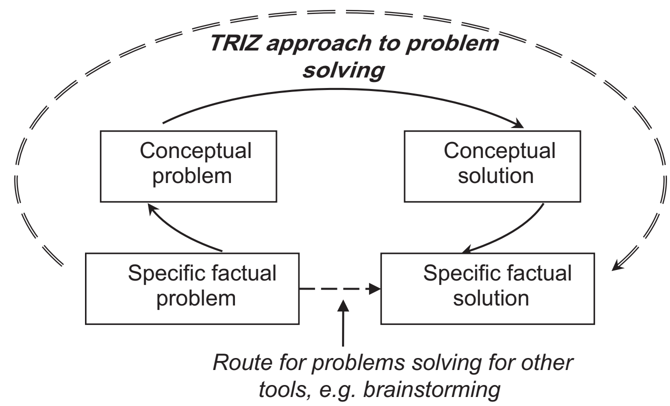

Fig. 1. TRIZ systematic approach to problem solving (the TRIZ prism) (adapted from Savransky (2000) and Gadd (2011)).

Central to TRIZ is the set of conceptual solutions to technical problems. This set of solutions is a collection of the inventive principles, trends of technical evolution and standard solutions as provided by TRIZ (Gadd, 2011). To apply any of these solutions (explained further in Section 5), a specific and factual technical problem is reduced to its essentials and stated in a conceptual format. In its conceptual form, the problem can then be matched with one or more of the conceptual solutions. The identified conceptual solution can afterwards be transformed into a specific, factual solution that answers to the original factual problem.

This approach is the overview of the TRIZ problems solving process. It is a distinctive feature of TRIZ, distinguishing it from other conventional problem solving methods (e.g. brainstorming) that attempt to find specific factual solutions to factual problems directly (see Fig. 1).

4. Main concepts in TRIZ – contradiction, ideality and patterns of evolution

The concepts of contradiction, ideality and evolution patterns introduced by Altshuller are central to TRIZ and at least one of these concepts is applied in any TRIZ problem solving process. These are explained below.

4.1. Contradiction

Contradictions are indicative of inventive problems arising from the apparent incompatibility of desired features within a system. Resolving the contradictions solves the problems. There are two major types of contradictions: technical contradictions and physical contradictions.

- Technical contradiction: This arises when an attempt to improve certain attributes or functions of a system leads to the deterioration of other attributes of that system. For example, the bigger, more powerful engine proposed for a car to increase its speed would contribute more weight to the car, which in turn limits how fast it can travel, therefore negating the desired benefit of increased speed.
- Physical contradiction: This arises when there are inconsistent requirements to the physical condition of the same system. For instance, a system might have a function (or be in a state) which is both beneficial and adverse or unpleasant. For example, an umbrella’s big size helps with protection from rain, but may make it too cumbersome to carry around, and therefore, its size requirements (big umbrella for protection and small umbrella for convenience) present a physical contradiction.