THE TRIZ-FRACTAL MODEL:
Part 1 - On Facilitating the Rapid Diffusion of TRIZ

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INTRODUCTION

This short article addresses two main questions:

- What is the TRIZ-Fractal Model?
- What are applications of the TRIZ-Fractal Model?

It would be useful to address the question: "How can the TRIZ-Fractal Model be applied?" Since this is an introductory article and meant to be short, this question is not dealt with here. Follow-up articles are planned that will present more real-life applications of the TRIZ-Fractal Model. For now, the two main questions will be briefly considered.

WHAT IS THE TRIZ-FRACTAL MODEL?

The TRIZ-Fractal Model[1] is a simplified version of what I refer to as the "Basic Universal Template."[2] Both models comprehensively depict the elements of a system using concepts mainly from traditional systems analysis, TRIZ, and linguistics. The Basic Universal Template is more generic but also more abstract, especially from the viewpoint of TRIZ. The template was therefore simplified and variables described using the language of TRIZ. A network diagram of the TRIZ-Fractal model is shown in Fig. 1.

Each oval shape in Fig. 1 could be regarded as the central object of a mind map so that the rules for constructing a mind map[3] could be applied to each encircled description. Consequently, Fig. 1 could be regarded as a template for a multi-centric mind map. Nevertheless, other visual techniques such as hierarchical outlining and concept mapping can be applied to it.

The TRIZ-Fractal model is a multi-level systems model. Embedded in the TRIZ-Fractal model[4] are the following models:

- Substance-Field Analysis (TRIZ) or Minimal Functional Analysis
- Tool-Object-Product (TOP)[5]
- Subject-Object-Action (SOA)[6] or Subject-Verb-Object (SVO)
- Creative Web[7]
- System: Input; Processing; Output; Environment; Feedback

Concepts of learning are also embedded in the design of the TRIZ-Fractal model. In particular, the TRIZ-Fractal model encourages analogical and reflective thinking. The acronym, "SCAMPER-DUTION" is related to Alex Osborne's SCAMPER[8] and refers to letters representing the verbs of heuristics such as the 40 Inventive Principles; the letter "X" could be added to represent verbs that are not covered by the acronym, SCAMPER-DUTION.[9]

Fig. 1: TRIZ-Fractal Model (Simplified Basic Universal Template)

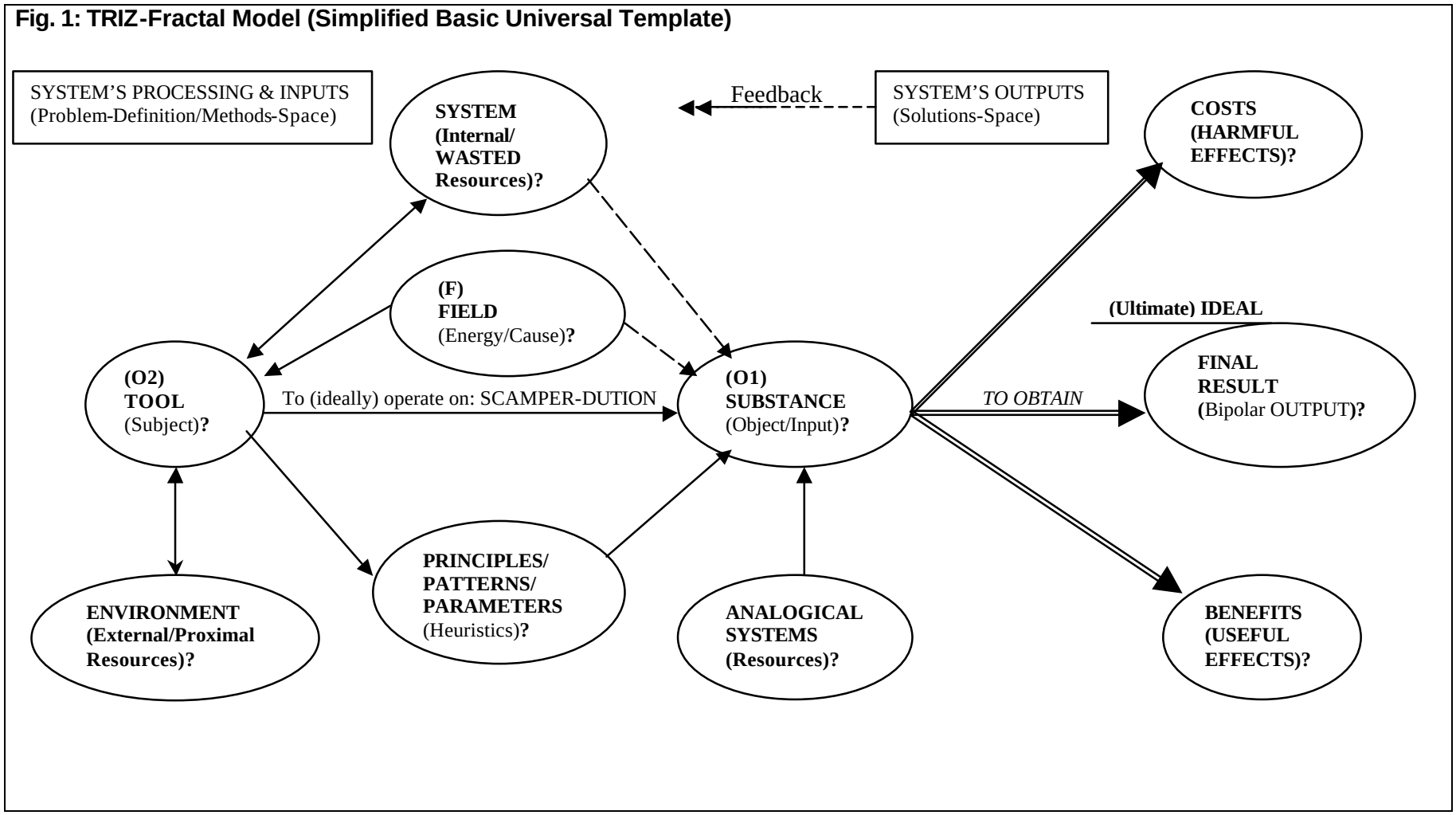

Fig. 2: Matrix Side of the Universal Thinksheet™

Universal Thinksheet™ for Deconstructing Product-Solutions, Deep Innovation-Learning™, and Solving Bipolar Problems

Innovation Project: …….. **Sheet …… of ……**

Framework	*Processing 1*		*Input*	*Processing 2*	*System*	*Environment*		Output 1	*Processing 3*			*Output 2 (Effects)*	
Creative Web	Methods-Space 1		Problem Definition-Space	Methods-Space 2	*System*	Creative Life-Space (Life Cycle)		Solutions-Space 1	Methods-Space 3			Solutions-(Bipolar/Dialectical/Conflict-) Space 2	
Object/ "Thinking Hat"/ Theme/ Reference:	**P1: Principles/ Patterns/ Paradigms (Noun/Verb)**	**Disruption-Description: Adjective [(anti-) convention/ disruption/ vision]**	**O1: Substance/ Problem/ Constraint/ Target**	**O2: (Functionally equivalent) Tools/ Devices/ Means/ Strategies**	**O3: System(s)/ Elements/ Internal (WASTED) Resources**	**O3.1: Environment/ External or Proximal (PESTLIED/ Space/Time) Resources**	**O3.2: Switching/ Analogous or Anti-Objects/ Competing Typology**	**O4: Final Result (Technical/ Emotional Output)/ IVY-Object/ 8020-Result**	**P2: Parameters/ Attributes/ Variables/ Features/ (Un)changing Dependency**	**F: (Multi-level) Fields/ Causes/ Motivation (Subtext)**	**Verb1: (Positive; Negative; Neutral) Function/ Purpose/ Processing**	**O(+): Unexpected (Potential) Advantages - Strengths/ Opportunities/ Wins (Gains)**	**O(-): Unexpected (Potential) Disadvantages - Weaknesses/ Threats/ Losses**

WHAT ARE APPLICATIONS OF THE TRIZ-FRACTAL MODEL?

The TRIZ-Fractal model is the core tool of the Universal Thinksheet™. There are two representations of the TRIZ-Fractal model: as a network diagram (such as in Fig. 1) and as a "matrix structure of a database record" (see table in Fig. 2). Both representations are complementary and it is suggested that both be used. The network diagram is useful for teaching and learning TRIZ, especially with regard to illustrating concepts such as ideality; ideal final result; substance-field; resources; self-X. Also, individual heuristics such as each of the 40 Inventive Principles and 76 Standard Solutions could be illustrated using the TRIZ-Fractal model.

The matrix representation of the TRIZ-Fractal model may be used for more sophisticated modelling of problems and solutions as well as vertical and lateral brainstorming. While two or more network diagrams may be required for presenting resolution of technical, physical, and administrative contradictions, only one matrix is necessary for presenting or illustrating such contradictions. The matrix side is therefore more efficient in its use of space. However, use of the matrix side is facilitated by a deep understanding and use of the network diagram.

As a generic and multi-level systems model, the TRIZ-Fractal model may be used for activities including documentation, modelling, creativity, problem solving, and visual ideas management. In the context of the methodology of TRIZ, the TRIZ-Fractal model may be used for the following purposes:

- **Teaching and learning fundamentals of TRIZ:** "tool"; "substance"; "field"; "ideality; ideal final result; patterns; principles; resources; self-X
- **(Re)Discovering and illustrating heuristics in TRIZ:** each Inventive Principle; Pattern of System (Technological) Evolution; Standard Solution
- **Documenting as well as brainstorming on problems and solutions:** technical, physical, and administrative contradictions
- **Modelling ("extreme") problems and solutions:** functional (situational) modelling; failure (subversion) analysis; anticipatory failure determination; best/worst scenarios
- **Matching and mixing tools of TRIZ as well as in other methodologies**
- **Illustrating concepts such closed-system resources and open-system resources in the solution of problems:** closed-system solutions and open-system solutions
- **Impact (cost-benefit) analysis of alternative solution strategies or scenarios**

CONCLUSIONS

This article – the first in a series on the TRIZ-Fractal model - provides a brief background on the TRIZ-Fractal model and its possible applications. Follow-up articles will demonstrate specific applications of the TRIZ-Fractal model, especially in resolving contradictions. The author feels that the TRIZ-Fractal model could facilitate the rapid learning and use of TRIZ in many and diverse domains. Consequently, the TRIZ-Fractal model is envisaged to play a significant role in the widespread diffusion of TRIZ. Beginners in TRIZ are especially invited to experiment with and try out the TRIZ-Fractal model. The author would welcome feedback from readers of this article as well as users of the TRIZ-Fractal model.

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Notes

[1] With regard to my description of the model as a "fractal", may I note that I am using "fractal" in a soft sense. I have referred to the model as a fractal on the basis of its (qualitative or structural) self-similarity. To be more precise, the TRIZ-Fractal Model is an extended traditional systems model, the main objects of which are input, processing, output, environment, and feedback. As every dynamic system could be described using this same model, e.g., at system, element, and supersystem-level, the structure of the model could be regarded as repeatable at different scales. In the context of classic TRIZ, this same model could be used to describe the structure of dynamic "substances", "tools", "systems", and "supersystem." Hence, my use of the term "TRIZ-Fractal Model." The fractal description emphasizes the ideas of scalability and recursivity in the model as well as reflects the idea that a system is "a system of systems is a system of systems is …"

[2] For more discussion of the Basic Universal Template, which was previously referred to as the "Basic Universal Template", see King, R. (2002). *The Theory of Ideal Supersmart Learning: A Versatile Framework for Rapidly Simplifying, Learning, and Applying TRIZ & Other Problem-Solving Methodologies.*
http://www.triz-journal.com/archives/2002/04/d/index.htm or
http://www.supersmartnetwork.com

[3] For details on mind mapping, see Buzan, T.; Buzan, B. (2000) *The Mind Map Book.* London: BBC Books.

[4] The TRIZ-Fractal model is strongly related to "triads"; see Kowalick, J. (1998) *Triads: Their Relationship with TRIZ.*
http://www.triz-journal.com/archives/1998/06/a/index.htm

[5] See Royzen, Z. (1999) *Tool, Object, Product (TOP) Function Analysis*.
http://www.triz-journal.com/archives/1999/09/d/index.htm

[6] See, for example, Belski, I. (1999) Solving *Problems with Method of Ideal Result.*
http://www.triz-journal.com/archives/1999/09/d/index.htm

[7] See King, R. *Darwin and Creativity* in: Greenfield, T. (Ed.) (2002) *Research Methods for Postgraduates.* London: Arnold, pp. 115-120.

[8] See, for example, Michalko, M. (1998) *Thinkertoys.* California: Ten Speed Press.

[9] For a SCAMPER-DUTION matrix of solution strategies, see King, R. (2002). *The Theory of Ideal Supersmart Learning: A Versatile Framework for Rapidly Simplifying, Learning, and Applying TRIZ & Other Problem-Solving Methodologies*.
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