THE THEORY OF IDEAL SUPERSMART LEARNING:
A Versatile Holistic Framework for Rapidly Simplifying, Learning, and Applying TRIZ & Other Problem-Solving Methodologies – **Part I**

Dr. Rodney K. King

www.supersmartnetwork.com

r.k.king@supersmartnetwork.com

Foreword

This article introduces the Theory of Ideal SuperSmart Learning and contains a set of tools for personal, business, product and institutional development. The Theory of Ideal SuperSmart Learning is like a “theory of everything” and provides a framework for activities including the following:

- rapidly generating breakthrough ideas and gaining deep insights in diverse domains
- rapidly simplifying, learning, integrating, and applying methods of
  - problem solving (including TRIZ and creative problem solving)
  - creativity (the whole spectrum of creativity tools and techniques)
  - ideas management (including mind mapping and concept mapping)
- rapidly solving problems involving conflicts, contradictions, or dilemmas in business as well as product development
- rapidly improving products in diverse domains
- conceptually designing or inventing products in diverse domains
- “smarter”, versatile, and accelerated learning in diverse domains
- rapidly create magic tricks and routines

The article on the Theory of Ideal SuperSmart Learning contains three parts. In part I, an overview of the philosophy and framework of the theory is presented. Part II presents applications of the theory. In particular, the theory is used to simplify and integrate tools of TRIZ as well as other problem solving methodologies. In part III, the main conclusions of the article are presented.

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PART I: OVERVIEW OF THE FRAMEWORK FOR IDEAL SUPERSMART LEARNING

1. INTRODUCTION

Several years ago and in the course of my hobby, I encountered an "impossible problem": How to systematically invent magic tricks? To this day, I'm wrestling with the problem of "automated" invention.

It was my quest for a systematic method of inventing magic tricks that led me to **TRIZ**, which is a Russian acronym for the **"Theory of Inventive Problem Solving."** Genrich Altshuller, a Russian scientist and naval patent officer, pioneered TRIZ in the 1940s. Information on the evolution of TRIZ could be found in Internet web sites[1] and a few books in English[2].

Initially, I was excited to discover TRIZ. Published comments on the background, development, and power of TRIZ led me to believe that I could use TRIZ to directly invent magic tricks. But, I was disappointed. My serious reading on TRIZ began with Altshuller's *"And Suddenly the Inventor Appeared."* I later went on to read other publications, especially on the Internet. However, I found it difficult to thoroughly understand TRIZ, let alone apply it to solve my impossible problem of systematically and transparently inventing magic tricks.

My basic academic and professional disciplines cover civil engineering, infrastructure planning, and regional development planning. TRIZ, however, seems to be grounded in mechanical engineering and product development. Although there are claims that TRIZ is a generic methodology for problem solving and there are increasing attempts to "generify" TRIZ, TRIZ still appears to be limited in the context of open-ended or "wicked"[3] problems, especially in non-physical systems.

The **Theory of Ideal SuperSmart™ Learning (TISL)** is the culmination of my efforts to find a framework that could be used for solving all types of problems: well-defined and ill-defined problems; close-ended and open-ended problems; "tame" and "wicked" problems; mathematical and non-mathematical problems; "soft" and "hard" problems. The framework of Ideal SuperSmart™ Learning is holistic and could be used for applying all methods of problem solving, creativity, and ideas management. In addition, principles and tools of Ideal SuperSmart™ Learning could be used to more systematically invent magic tricks as well as routines.

In the rest of this article, I shall present some results of my experience in using the framework of Ideal SuperSmart™ Learning. I shall outline a framework that could be used to not only simplify the learning and

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[1] Web sites on TRIZ could be found at www.creatriz.net , www.triz-journal.com, and www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/eTRIZlinks.html

[2] As TRIZ was originally developed in Russia, the majority of publications on TRIZ are in the Russian language. There are few books on TRIZ in the English language. A brief description on the evolution of TRIZ could be found in Savransky (2000).

[3] The term, "wicked problem", is associated with Horst Rittel. A *wicked problem* has no known solutions, templates, heuristics, or algorithms. For more information on *wicked problems*, see Rosenhead & Mingers (2001).

application of TRIZ but also integrate TRIZ with other methodologies of problem solving, creativity, and ideas management.

2. GOAL, OBJECTIVES, AND TOOLS OF IDEAL SUPERSMART™ LEARNING

In the Theory of Ideal SuperSmart Learning, "smart" and versatile learning are assumed to be at the centre of not only successful problem solving, creativity, and ideas management but also rapid product improvement, innovation, and invention. Ideal SuperSmart™ Learning could be defined in many ways. One approach is based on the concept of "supersmartness"[4]. The focus in this article, however, is from the general perspective of "ideality" and in particular, an "ideal object."

An **ideal object** is defined as a system that either infinitely demonstrates its potential functions and properties or infinitely attains its objectives under *(internal) conditions of ideality*[5], e.g., using no external (additional) resources or "freely" available resources, and without causing any disadvantage or negative (harmful/undesirable) side effect. The aforementioned definition refers to an ideal object at a macro-level. At a meso-level, an ideal object could be regarded as a closed (self-contained), self-organising, "self-informative", and self-regulating system that has infinite efficiency and versatility but may not materially exist.[6] An ideal object could be a field, wave, or void that has ideal elements and attributes as well as belong to an ideal supersystem. Also, an ideal object is assumed to be implicitly or explicitly purposeful.[7] The goal of Ideal SuperSmart™ Learning subsumes this concept of an ideal object.

The crux of the Theory of Ideal SuperSmart™ Learning is that **in an ideal world, one would deeply question, understand and know everything from nothing and in no time**. This goal, together with objectives and tools of Ideal SuperSmart™ Learning, is presented in Fig. 1.

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[4] Microsoft (Bill Gates) uses the concept of supersmartness to hire computer programmers. According to Stross in Heller (2000), **supersmart people** have the following attributes: "ability to grasp new knowledge very fast"; "ability to pose acute questions instantaneously"; "perception of connections between different areas of knowledge"; "at-a-glance 'linguistic ability' to interpret software code"; "obsessive concern with the problem on hand, even when away from work"; "great powers of concentration"; "photographic recall of their work."

[5] *Conditions of ideality* exist at macro-, meso- and micro-levels. In general, these conditions vary from domain to domain and from one category of "objects" to another. *Conditions of ideality* are stable at the macro-level but more differentiated at lower levels.

[6] The above concept of an *ideal object* is similar to that used in the classic TRIZ methodology. However, there are some differences. The first is that the concept of an **"object"** in Ideal SuperSmart™ Learning refers to everything, both tangible and intangible items. Second, Ideal SuperSmart™ Learning explicitly assumes that a function does not exist out of use or operation, i.e., out of context. A system's function could therefore be described as a potential process for achieving particular outputs, results, or states. Finally, the definition of a function in Ideal SuperSmart™ Learning highlights bipolarity: infinity (ubiquity; eternity) on the one hand and zero (nothingness) on the other hand. When an external or additional resource is used in an *ideal object*, the new resource should be "freely available" or the returns based on the required input should be infinite.

[7] The concept of "invisible hand" in market economics may be an example of an *ideal object*.

GOAL OF IDEAL SUPERSMART™ LEARNING:
To deeply know and understand everything from nothing and in no time

OBJECTIVES ("Core Competencies"):

- To facilitate Versatile Thinking™ as well as Versatile Learning™
- To rapidly simplify, learn, apply, and integrate methods of problem structuring & solving, creativity, and ideas management
- To enhance the following:
  - SuperSmart proficiency in improvement tasks
  - SuperSmart proficiency in invention tasks
  - SuperSmart proficiency in identification/detection tasks
- To facilitate "improbable thinking", systematic generation of breakthrough ideas, and resolution of conflicts as well as dilemmas

"MENU" OF TOOLS:

- Macro-tools:

  Paradigmatic tools:
  - Template Theory for Versatile Creativity
  - Pattern And Object (PAO) Thinking
  - B.E.A.R. Strategy
  - Conjurology

  Other Macro-tools:
  - Ideal Meta-cognition ("thinking about thinking")
  - Ideal Meta-learning ("learning about how to learn")
  - Ideal Meta-ideas management ("managing ideas about ideas management")
  - Structured Intuition, Analysis, and Reflection (SIAR)

- Meso- and Micro-tools:
  - System of Problem Archetypes and Anti-archetypes
  - Solution Archetypes
  - Creative Web
  - Versatile, Implementation, and Creative LifeSpace Maps
  - Versatile Matrix; Versatile Checklist
  - Basic IVY-Template for Strategic Problem Solving
  - SCAMPER-DUTION Matrix of Patterns for Solution-Plots, Properties, and Devices
  - IVY-Matrix of Bipolar Variables, Dimensions, and Criteria
  - IVY-Thesaurus of Potentially Unusual Plots, Properties, Actions, and Devices
  - ObjectBots; Scene-Transformation Matrix
  - CreaLogic; Paoisms; Object-Templates
  - IVY-Pyramid of Innovation
  - Six Colored Eyes
  - …

Fig. 1: Goal, objectives, and tools of Ideal SuperSmart™ Learning

The goal of Ideal SuperSmart™ Learning is acknowledged to be impossible. For instance, it would be an impossible task for someone to know and understand everything (in the universe) from nothing and in no time. The goal of Ideal SuperSmart ™ Learning therefore reflects **utopic ideality**. This goal, like a *normative mission statement* for an organisation, provides a constant vision and an ideal orientation as well as a benchmark for determining deficits of the actual from the ideal. *Utopic ideality* is also useful for exploring unusual possibilities, especially when searching for creative ("out-of-the-box") concepts.

In the real world, "minimality" often replaces "nothingness" or "zeroness." For day-to-day activities, one would therefore speak of **practical ideality** and **practically ideal objects** rather than *utopic ideality* and *utopic ideal objects*. Many practically ideal objects may appear conceptually unusual but are highly effective and/or efficient with respect to their functions. Nature, through the process of evolution and natural selection, provides many examples of practically ideal objects and solutions, i.e., systems that are largely self-contained, self-organising, self-informative, self-regulating, and versatile (adaptive).

In human learning environments, supersmart learners epitomise *practical ideality*. A **supersmart learner** would rapidly know as well as understand many and diverse subjects using an apparently small knowledge base. Supersmart learners often display mastery of skills of versatile problem solving, creativity, and ideas management as well as self-directed learning. Supersmart learners in real life are often described as "geniuses" or "polymaths." The key and rather ideal assumption of this article is that Ideal SuperSmart™ Learning is learnable, i.e., everyone has the potential to be a supersmart learner. Ideal SuperSmart™ Learning could be regarded as a language that anyone could learn and speak.

Objectives of Ideal SuperSmart™ Learning directly relate to the goal of *utopic ideality* but are nevertheless pragmatic. The objectives focus on general activities such as versatile thinking, problem solving, creativity, and ideas management as well as specific tasks such as improvement, invention, and identification/detection. One aim of Ideal SuperSmart™ Learning is to develop as well as make available a vocabulary and language for more fully understanding and quickly coping with uncertainties, dilemmas, and complexities in the Information Age.

A hierarchy of tools has been devised to attain the objectives of Ideal SuperSmart™ Learning. At the highest level are macro-tools. These include paradigmatic tools such as Template theory, PAO thinking, and B.E.A.R. strategy as well as other macro-tools such as ideal meta-cognition, ideal meta-learning, ideal meta-ideas management, and structured intuition, analysis, and reflection.

Meso- and micro-tools include the following: system of problem archetypes and anti-archetypes; solution archetypes; object mapping; the creative web; versatile map; IVY-template; SCAMPER-DUTION matrix; IVY-matrix

of bipolar variables, dimensions, and criteria; "objectBots", scene-transformation matrix; "creaLogic", "paoisms"; "object-templates."

3. THE IVY-PARADIGM AS THE MACRO-CONCEPTUAL FRAMEWORK FOR IDEAL SUPERSMART™ LEARNING

Although the concepts of *ideality* and an *ideal object* are mentioned during the discussion on the goal of Ideal SuperSmart™ Learning, the paradigm on which Ideal SuperSmart™ Learning rests is not described. This section focuses on that paradigm, which has the acronym "IVY": **Ideality, Versatility, and "Ympossibility."**[8] "IVY-" could be broadly regarded as a prefix that means the following: *"self-contained*[9]*, self-organised, self-informative, self-regulating, and versatile (multi-polar)."*

The IVY-paradigm is fundamental to deeply understanding and applying Ideal SuperSmart™ Learning. The IVY-paradigm directly relates to all objectives and nearly all tools of Ideal SuperSmart™ Learning. In Ideal SuperSmart™ Learning, a *practically ideal object* has multi-level properties and is synonymous with an IVY-object. Thus, an **IVY-object** not only performs its core, primary, or "technical" functions but also is self-contained and displays, at no (extra) cost, properties of self-organisation, "self-informativeness", self-regulation, and versatility. The prefix, "IVY-", could be applied to any artefact, organism, or idea. Consequently, we may have the following: IVY-final result; IVY-mobile phone; IVY-pen; IVY-air bag; IVY-student; IVY-spoon; IVY-effect; IVY-prop; IVY-gimmick; IVY-character; IVY-trick; IVY-screen; IVY-problem; IVY-method; IVY-solution; IVY-TRIZ; IVY-organisation; IVY-process; IVY-management; IVY-team.

As indicated in the acronym, "IVY", the paradigm rests on the triangle of ideality, versatility, and impossibility. In a way, the concepts of versatility and impossibility could be derived from the concept of ideality. Nevertheless, I consider versatility and impossibility to be important enough to warrant separate treatment.

Unlike in TRIZ, the ultimate output in Ideal SuperSmart™ Learning, i.e., the **IVY-Final Scenario**[10], is bipolar. There is a "best (positive)" IVY-Final Scenario at one end and a "worst (negative)" IVY-Final Scenario at the other

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[8] The acronym, IVY, also reflects the life cycle (birth/growth/maturity/decline/death) of a product. When a product is first invented, it is usually mono-functional. In other words, the product is mainly designed to perform one function. As time progresses, the product matures and moves towards "ideality" and "versatility." Thus, more functions, features, and parts are added, especially to satisfy emerging needs. Finally, the product becomes multi-functional but is now complicated or "convoluted." In the language of the IVY-paradigm, the product becomes "ympossible." At this stage, decline or death of the product is nigh, especially if a substitute, next-generation product does not emerge. When next-generation products are developed, they may constitute a new *genus* or super-system.

[9] Self-containment in Ideal SuperSmart™ Learning means that inputs, processing, outputs, interfaces, and the environment constitute an object's **"unitary (all-in-one) space."**

[10] The targeted output in TRIZ is described as the Ideal Final Result (IFR). The IFR is considered to be a special case of the IVY-Final Scenario. Other final outputs in Ideal SuperSmart™ Learning could be described as the "Versatile Final Scenario" and "Ympossible Final Scenario."

end. The latter could be referred to as **anti-IVY-Final Scenario**. The notions of bipolarity and qualitatively different final scenarios indicate that the concept of ideality is not value-judgement free. In short, the IVY-Final Scenario is subjective.

"Best ideality" is often meant when people speak of ideality. However, the idea of *"worst ideality"* should not be ignored. *Worst ideality* is a provocative construct that is useful for creative ("out of the box") thinking, failure analysis, recognition of pervasive constraints in systems, and (re)formulation of objectives that take into account unusual causal factors in situations. Also, the concept of *worst ideality* could be used for carrying out **"extreme sensitivity analysis"** and subsequently, devising **"extreme contingency scenarios (plans)."**

In this article, best IVY-Final Scenario is considered as the default output of Ideal SuperSmart™ Learning. Unless otherwise stated, best IVY-Final Scenario is synonymous with the term of "IVY-Final Scenario." Selected conditions and criteria for the IVY-Final Scenario are contained in table 1. The range of conditions and criteria indicates that there is no unique description of ideality.[11] Many levels and dimensions of ideality exist. Although the majority of criteria reinforce each other and are positively correlated, a few criteria such as *ideal nothingness* and *ideal infinity* conflict with each other. *Utopic criteria*, which are often used in science and theoretical engineering, could be used to practise, reflect on, and facilitate *improbable thinking*.

Between the IVY-Final Result and anti-IVY Final Result lies the neutral (zero) or non-IVY-Final Result. The **non-IVY-Final Result** is regarded as transitory or "on the edge of chaos." Consequently, an object on a *bipolar spectrum of IVY-Final Scenario* moves either towards or away from the best IVY-Final Scenario.

The IVY-Final Scenario could be purely descriptive or may be operationalised using rating scales[12]. The most common rating scales are the ratio and ordinal scales. The concept of "IVYality"[13] replaces the IVY-Final Scenario at an operational level. Thus, one may speak of levels and degrees of "IVYality." The basic measurement variables of IVYality are "*advantages*" and "*disadvantages*."[14] Consequently, the **level of IVYality** could be expressed on an interval scale and defined as the difference between the advantages and disadvantages. The *level of IVYality* corresponds to the concept of net worth (benefit).

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[11] *Ideality* in TRIZ focuses on the objectives of *ideal ("functional") nothingness, ideal conflict resolution,* and *ideal efficiency*. The core of TRIZ is the observation that the properties of improved and invented (patented) artefacts tend towards *ideality* in terms of *ideal ("functional") nothingness*, *ideal conflict resolution*, and *ideal efficiency*. TRIZs *40 Inventive Principles* could largely be regarded as strategies for *ideal conflict resolution* and *ideal efficiency*, especially in artefacts.

[12] See, for example, Delp et al (1977) and Jones (1980).

[13] *IVYality* is a multi-dimensional interpretation and multi-level extension of *ideality*, especially as espoused in TRIZ.

[14] Theoretically, advantages and disadvantages should finally be expressed in the same unit of measurement, e.g., monetary unit, energy unit, or dimensionless value of (standardised) utility.

Table 1: Basic conditions and criteria for *IVY-Final Scenarios (IVYality)*

Item no.	**Basic conditions for *IVY-Final Scenario (IVYality)***	**Utopic criteria (Descriptions)**	**Practical criteria (Descriptions)**
1	Ideal ("functional") nothingness	Zero; No; None; Nothing; Vacuum; Void	Minimum; Minimal; Micro-; Molecular; Nano-; Least; Invisible; Dummy; Redundant
2	Ideal infinity	Infinity; Infinite; Total; All; Eternal; Omni-; Ubiquitous; Everything	Maximum; Maximal; Giga-; Mega-; Macro-; Largest; Highest
3	Ideal efficiency & "automaticity"	Perfect or absolute efficiency; Perfection; Automatic; Self-working	Near-perfect or absolute; Best; Optimal; Pareto; Sub-optimal; Satisficing; Second-best
4	Ideal conflict resolution & unity	No conflict, contradiction, or dilemma; Win-win; Frictionless; Perfect unity	Insignificant conflict, contradiction, or dilemma; Win-lose; Trade-off; Compromise;
5	Ideal simplicity, variety, & beauty	Perfect or absolute: simplicity; variety; beauty; elegance; degree of freedom or movement	Maximum or highest level of: simplicity; variety; beauty; elegance; degree of freedom or movement
6	Ideal identification, detection, and branding	Universal: Identification; detection; branding	Global: Identification; detection; branding

The **degree of IVYality** (or **IVYality efficiency**)[15] refers to the ratio of advantages to disadvantages. In an ideal world, advantages would be infinite and disadvantages would be zero. Consequently, both the level and degree of *IVYality* would be infinite. In the real world, however, constraints exist and a **"maxi-mini" strategy**, i.e., maximisation of advantages and minimisation of disadvantages, would be adopted in order to maximise the *IVYality-efficiency* or *level of the IVY-Final Result*.

Versatility is an integral part of the IVY-paradigm as well as the concept of an ideal or IVY-object. In Ideal SuperSmart™ Learning, versatility is synonymous with the concepts of *multi-level hierarchy* and *multiple bipolarity*.[16] Versatility is encompassed in the **principle of object equivalence**, **principle of multi-polarity**, and **B.E.A.R. strategy**[17], each of which is an element of Versatile Thinking™. B.E.A.R. is an acronym for *Bring Every Available Resource*. The B.E.A.R. strategy is a cognitive approach that encourages versatile and "improbable" thinking; it is more an attitude towards thinking than an operational strategy in physical systems. Thus, the B.E.A.R. strategy implies that, to achieve an objective, a person should consider every available resource, especially resources in the span of a bipolar spectrum such as for creative and logical thinking. Also, multi-level resources, e.g., resources at level of a system, its elements, and supersystem, should be considered. A principal aim of the B.E.A.R. strategy is to overcome *psychological inertia* and facilitate **improbable thinking** during activities of problem solving, creativity, and ideas management.

"Ympossibility" or impossibility is the aspect of the IVY-paradigm that deals exclusively with overcoming *psychological inertia*, especially facilitating *improbable thinking* in problem solving, creativity, and ideas management as well as in performance delivery, i.e., theatrical communication or presentation. Magic is a metaphor for impossibility. Magic could be used to enhance *improbable thinking*. My main approach for confronting and being comfortable with the impossible is to analyse, improve, create, and present magic (conjuring) tricks as well as routines. A useful, constructivist maxim for rapid innovation, creativity, and design is to always start with at least two known(dis/similar) objects and "operate" on the object using *improbable thinking* and its tools.

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[15] The *degree of IVYality* is similar to TRIZs *ideality*. If advantages are expressed as benefits or desirable outputs (effects) while disadvantages are respectively expressed as total cost or inputs plus undesirable outputs (effects), then TRIZs *equation of ideality* may be obtained. In TRIZ, **ideality** = sum of useful functions/sum of harmful functions = sum of benefits/sum of expenses and harms; see Savransky (2000, pp. 76-77).

[16] The *IVY-Matrix of Bipolar Variables, Dimensions, and Criteria* contains several descriptions of bipolarity and bipolar variables; see section 5.6 of this article.

[17] The B.E.A.R. strategy is discussed and illustrated in a chapter that I authored (*When to use creativity*) in Greenfield, T. (ed) (2002), *Research Methods for Postgraduates,* London: Arnold. The B.E.A.R. strategy assumes that creative and logical thinking exist on a continuum.

At the core of every successful magic trick is *bipolarity* or what TRIZ calls a *physical contradiction*.[18] In the language of TRIZ, principal props and gimmicks in magic tricks (apparently) perform their functions and do not perform their functions. For instance, in a magic trick involving the disappearance of a coin, the *physical contradiction* may be expressed as "the coin exists and does not exist." The formulation of a magical disappearance effect as a *physical contradiction* suggests several dichotomous strategies or *separation heuristics* for resolving the (apparent) physical contradiction. TRIZs **separation heuristics** include the following solution-paths: *separation in space*; *separation in time*; *separation between part and whole*; *separation upon condition.* Thus, magic or conjuring affords many opportunities not only for exploring, discovering, formulating, and resolving *physical contradictions (dilemmas)*[19] but also for demonstrating them in an entertaining manner. Conjuring could facilitate the systematic development of sub-categories for each *separation heuristic*. Similar opportunities exist for dealing with **technical contradictions (dilemmas)**[20] in the improvement or design of gimmicked apparatus and utility gimmicks.

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[18] In my theory of magic, a **magical effect** is a *physical contradiction* that consists of two contradictory states: "critical situation before magical climax" and "situation at magical climax." In visual magic, a spectator experiences a sensation of awe or wonder when the spectator sees the *critical situation* and the *magical climax* but immediately fails to see a "logical bridge (solution-path)" between both situations.

[19] A "contradiction" in TRIZ corresponds to a "dilemma" or "paradox" in Ideal SuperSmart™ Learning. Contradictions may exist at level of elements (parameters), system, and supersystem.

[20] A **technical contradiction (dilemma)** refers to an inverse relationship between two situations or variables. In Ideal SuperSmart™ Learning, the situations are described as **"primary desirable situation"** and **"secondary situation."** There are two variants of the secondary situation: a *desirable secondary situation* and an *undesirable secondary situation*. Thus, there are two cases of a *technical contradiction (dilemma)*. In **case type I technical contradiction (dilemma)**, as the primary desirable situation increases or improves, the desirable secondary situation decreases or worsens. Case type 1 therefore involves a *decreasing function*. The ideal situation for *case type I technical contradiction (dilemma)* involves either maintaining the initial status or value of the secondary situation (*practical ideality: constancy*) or increasing the value of the desirable secondary situation as the value of the primary desirable situation increases (*utopic ideality: increase*). A *physical contradiction (dilemma)* is inherent in case type I.

Case type II technical contradiction (dilemma) involves an increase in a primary desirable situation being accompanied by an increase in an undesirable secondary situation. Thus, an *increasing function* is involved in case type II. Contradictions (dilemmas) of case type II may be resolved by either maintaining the initial status or value of the secondary situation (*practical ideality: constancy*) or decreasing the value of the undesirable secondary situation as the value of the primary desirable situation is increased (*utopic ideality: decrease*).

It is important to note that conventional problem solving seeks **optimisation or trade-offs** in systems with case type I *technical contradictions (dilemmas)*. Optimal solutions are "below" or at best, coincide with *practically ideal solutions*. *Utopic ideal solutions* are, by definition, superior to optimal solutions. Resolving contradictions or dilemmas from a practially ideal point of view involves **reframing** a given situation to one of *increasing the desirable secondary situation or decreasing the undesirable secondary situation while maintaining an increase in the primary desirable situation*. In the **Theory of Constraints** (Goldratt, 1994; Schragenheim, 1999), this process is referred to as **"subordination."** In other words, the primary desirable situation should be subordinated to the secondary situation while all other constraints ("tertiary situations, variables, parameters, or resources") in the system are exploited or exhausted. Constraints or resources to first exploit or concentrate on might be those *tertiary resources or parameters* which are strongly correlated with the secondary situation but relatively independent of the primary situation.

An activity for developing versatile problem solving is trying to figure out - from technical, psychological, and presentational perspectives - the "secrets" of presented, recorded, and catalogued magical effects. I have dubbed this approach of scientifically studying magic tricks as **"conjurology."** Conjurology[21] is an essential component and "enhancer" of Ideal SuperSmart™ Learning.

4. FURTHER DETAILS ON TOOLS OF IDEAL SUPERSMART™ LEARNING

Some tools of Ideal SuperSmart™ Learning are listed in Fig. 1; an *interaction matrix* may be prepared to illustrate interrelationship between tools. Of the tools, only macro-tools are covered in this section. Macro-tools provide a conceptual framework for devising tools at the meso- and micro-levels. Also, macro-tools aim to facilitate a **paradigm shift**[22], eliminate *psychological inertia* and transform attitudes not only during problem solving, creativity, and ideas management but also thereafter. A qualitative but strong evidence of learning is positive transformation of behaviour towards dealing with (similar) problems.

Like macro-tools, meso- and micro-tools are generic. However in this article, meso- and micro-tools are presented within discussions on specific methodologies such as *Creative Problem Solving (CPS), TRIZ, Advanced Systematic Inventive Thinking (ASIT)*[23], and *Unified Structured Inventive Thinking (USIT)*[24]. The reason behind this approach is to focus on practical applications rather than theoretical aspects of meso- and micro-tools. As the B.E.A.R. strategy and conjurology are highlighted in the previous section, this section presents an overview of the remaining macro-tools.

TRIZs main tool for resolving *technical contradictions (dilemmas)* is the *40 Inventive Principles*. These principles are related to TRIZs **contradiction matrix**. Examples of *tertiary parameters* for some archetypal contradictions (dilemmas) in physical systems or artefacts may be obtained from TRIZs *contradiction matrix*. As the (*utopic ideal*) reframing of a given situation may involve a *physical contradiction (dilemma)* of the secondary situation (e.g., "the secondary situation should increase and not increase"), TRIZs *separation heuristics* may also be used to generate solution strategies when dealing with *technical contradictions (dilemmas)* of case type II.

[21] It is interesting to note that TRIZs concepts of ideality and modelling with "miniature dwarves" (smart little people) have validity or are coherent within the fantasy frame of magic.
[22] For more discussion on the concept of *paradigm shift*, see Kuhn (1996), Barker (1993), Covey (1999), and Clarke & Clegg (2000).
[23] Visit www.start2think.com
[24] Visit http://ic.net/~ntelleck; see Sickafus (1997). *USIT* and *ASIT* are TRIZ-related methodologies. The precursor to *USIT* is *ASIT*, while the precursor to *ASIT* is *SIT* (Systematic (Structured) Inventive Thinking). *SIT* is based on TRIZ and widely used in Israel. A *SIT* web site is at http://www.sitsite.com

4.1 **Paradigmatic Tools**

Template Theory for Versatile Creativity

Templates play a central role in the application of Ideal SuperSmart™ Learning and in particular, Versatile thinking™. A **template, pattern, or (archetypal) plot** could be defined as a deep (intrinsic) or surface (extrinsic) structure of a closed (self-contained) system. Like in language, templates may be used to produce outputs that are qualitatively or quantitatively similar. Outputs that are to be regarded as novel at a particular level of observation, however, should be quantitatively and qualitatively dissimilar.

Many disciplines implicitly use templates in conceiving and solving problems as well as in generating creative ("out-of-the-box") ideas. Methodologies that directly focus on a "template approach" include the following*: TRIZ methodology*; Christopher Alexander's *"Pattern Language*"; *"Software Design Patterns"*; Jennifer Kemeny's *"Systems Archetypes*"; Adrian Slywotzky and David Morrison's *"Profit Patterns*"; Joseph Campbell's *"Hero's Journey*"; Dariel Fitzkee's *"The Trick Brain."* In my view, the template, pattern, or (archetypal) plot approach may be the most efficient means for rapidly acquiring creativity and problem solving skills across a wide variety of domains. Template approaches often focus on documenting existing "best" and "worst (anti-)" solutions such as in *benchmarking* and *software design patterns*. However, templates could have a normative orientation as in the case of archetypal (dramatic) plots, heuristics, algorithms, and patterns of evolution.

Below is my summary of axioms of the "Template Theory for Versatile Creativity."[25]

(i) **The occurrence and mutation of templates**: Every "object"[26] has one or more templates. And like "*memes*"[27], templates evolve and are passed from one generation to the next. Every solution to a problem constitutes a template. In general, templates that move towards *IVYality* survive and those that move away tend to suffer "death."

(ii) **Hierarchy and number of templates**: Templates in a methodology could be presented as a hierarchy of at least three levels: macro, meso-, and micro-levels. Templates become more qualitatively different and specific as well as increase in number as one moves down the hierarchy from macro- through meso- to micro-levels. *Macro-templates* are generic and based on heuristics.[28] In contrast, *micro-*

[25] The "Template Theory for Versatile Creativity" is a tool for enhancing creativity and not a model for explaining the process of visual recognition. In this respect, the template theory for versatile creativity differs from template matching and feature detection theories (Gross & Mcllveen, 1997; Eysenck & Keane, 1999).

[26] The word, "object", is used in a very liberal sense. An "object" refers to both tangible and intangible items.

[27] "Memes" are units of cultural information such as stories, songs, and customs. Richard Dawkins (1988) introduces the concept of memes in his book, "The Blind Watchmaker."

[28] Examples of macro-templates in TRIZ include the *40 Inventive Principles* and *Separation Heuristics*.

templates tend to be specific and algorithmic.[29] Experiential or concrete knowledge is often required for the formulation and use of *micro-templates*.

In every domain and at a particular time, there is a finite number of elemental templates that form an alphabet or higher-order templates.[30] Similar higher-order templates may exist in different domains.

Myriad higher-level templates, patterns, concepts, meanings, and "objects" could be generated using combinations of the alphabet of basic templates. *Schemas* and *scripts* (Boden, 1996) are examples of higher-order templates.

(iii) **Types of structural templates**: There are four basic structures for representing templates: stone-heap, linear, hierarchical, and network structures; see table for example of (object) structural templates.

Templates could exist in physical reality and may be visual, verbal, kinaesthetic, olfactory, and/or gustatory. Also, templates may be rigid (algorithmic)[31] or flexible (heuristic). "Out-of-the-box thinking" often uses flexible verbal templates. So-called "uncreative" people predominantly use rigid templates. Finally, templates could be means (tools) as well as ends.

(iv) **Generative rules for templates**: In every template are embedded many and varied rules[32] for generating and/or representing the template.

(v) **The occurrence of novelty**: "Basic creativity" or novelty occurs when, from an observer's point of view, generative rules for coherent templates – especially those that are explicitly known - are violated to form "emergent" (unexpected but higher-level coherent) patterns and objects. Basic creativity involves *bisociation* (Koestler, 1971) and transformation (unification) of conceptual spaces.

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[29] TRIZs meso- and micro-templates include the following: *76 Standard Solutions*; *Database of Physical, Chemical and Geometrical Effects*; *Algorithm for Inventive Problem Solving ("ARIZ")*.

[30] Examples of "alphabets" are the following: letters, words, and phonemes (language); elements in periodic table (chemistry); DNA (biology); systems archetypes (systems thinking); Biederman's "geons" and Ward, Smith, and Finke's "set of parts for creative imagery" (cognitive psychology/ drawing/invention).

[31] Examples of rigid (algorithmic) templates are mathematical formulae, scientific laws, and computer algorithms.

[32] For a discussion of generative rules and systems, see Boden (1996).

(vi) **Enhancing "basic creativity"**: "Unusualness" or *improbable thinking* is at the epicentre of creativity. Creativity involves possessing, developing, and/or applying unusual but coherent perceptions to situations. "Basic creativity" could be enhanced by the following experiential activities:

- Unusually observing, recognising, discovering, and exploring templates (patterns)
- Unusually deconstructing and analysing templates (patterns)
- Unusually adapting and modifying templates (patterns)
- Unusually exploiting or exhausting existing multi-level resources, opportunities, and constraints[33]
- Unusually combining, synthesising, "sculpting", or constructing templates (patterns)
- Unusually envisioning and transforming templates (patterns)
- Reflecting on each of the above activity

Pattern And Object (PAO) Thinking

Pattern And Object (PAO) Thinking™[34] operationalises the Template Theory, especially its first axiom. The philosophy of PAO Thinking™ is encapsulated in the following three interrelated principles:

(i) Principle of Object Equivalence
"Everything is an object."

This principle is derived from the concept of an object in **Object-Oriented Programming**.[35] In PAO Thinking™, an "object" refers to both tangible and intangible items. Artefacts, nature, elements of nature ("**naturfacts**"), and ideas are examples of objects.[36] This *principle of object equivalence* facilitates analogical thinking, knowledge transfer, and the development of a "creative database."

The definition of an "object", in the format of a *paoism*, is as follows:

an object is …
the universe of
an object is
an object of
an object is …

[33] Existing resources, opportunities, and constraints may be exploited by using the question-lead, "In how many and different ways could …?"
[34] PAO Thinking shares some concepts with Pattern Language (Alexander, 1979), which is used in architecture, urban design, and computer programming. Unlike Pattern Language, the foci of PAO Thinking are versatile creativity, ideas management, and versatile problem solving.
[35] See, for example, Taylor (1992). In PAO Thinking, "classes" and "messages" are also *objects*.
[36] In TRIZ, an object also refers to tangible and intangible items.

The above definition indicates that an *object* is a nested (hierarchical) system. The format of the definition is an adaptation and extension of Gertrude Stein's famous remark, *"A rose is a rose is a rose is a rose."* The above definition of an *object* is open-ended as well as recursive. The meaning of an object is retained when the definition is read from bottom to top. The definition's circularity could be illustrated by arranging the words to form a circle or loop. Also, the format is a template in which an object could be replaced by a specific item (for example, the word "fractal", "holon"[37], "resource", "function", or "attribute") or successively different items.

An alternative format for representing an *object* is presented in table 2. Elemental parameters in table 2 could be obtained from TRIZs *39 parameters*. The cells of the matrix could contain verbal and/or graphic descriptions. The template for the properties of an *object* is particularly useful for deconstructing and documenting the *unitary space* of an *object* during problem solving, creativity, and ideas management especially when developing, improving, or inventing products. The object-matrix could also be used for identifying and illustrating *technical contradictions* in a given system. If the properties of several (similar) *objects* are recorded in the object-matrix, this matrix could be used as a **morphological box (matrix)** for conceptually designing *objects*.

(ii) Principle of Interconnectedness
"Every object has an alphabet, a vocabulary and pattern."

This principle reflects reductionist, holistic, and systemic thinking. The *principle of interconnectedness* implies that everything in the universe is connected. Every object has its own elements and the object is also part of a larger (super-)system. This pattern principle has been echoed by the physicist, David Bohm, who says, "Everything is enfolded into everything." And Leonardo da Vinci expresses the *principle of interconnectedness* when he says that "Everything comes from everything and everything is made out of everything, and everything returns into everything …"

(iii) Principle of Multi-polarity
"Every object is the same and different."

This principle highlights the multi-level nature of objects. At the highest level of abstraction, all objects are the same. At the lowest level of abstraction, all objects are different. Nevertheless, the *principle of multi-polarity* may be metaphorically true in the case of Heisenberg's *uncertainty principle*. Using a poetic license within the framework of the *principle of multi-polarity*, one may say: "The speed of an electron matches and does not match."[38]

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[37] Koestler (1976) coined the word "holon" to describe an object that "behave partly as wholes or wholly as parts." In some respects, a *holon* is similar to an *object* as used in PAO thinking.

[38] This statement of mutually exclusive "states" is an example of a *physical contradiction (dilemma)*. It may be noted that each "state" in a *physical contradiction* is associated with a condition that may be implicit in the formulation of the *physical contradiction*. To formulate an operational solution for a *physical contradiction*, it is necessary to make explicit the conditions or assumptions that are implicit in the mutually exclusive states of the *physical contradiction*; an *evaporating cloud or conflict resolution diagram* may be used to reveal assumptions of *physical contradictions*.

Table 2: Object-matrix for defining the "unitary space" of a system ("object")

Name of system ("object"): …….

Main function(s)/objective(s): ……..…….

Variables in "Unitary Space" of System	**Name of Elements**	**Main Function(s)**	**Listed Parameters (Attributes/Properties) of Elements:** "Measurement"/Value
"INPUT" Elements: - Inputs - Materials/Substances/ Actions/Activities - Multi-level Resources			
"PROCESSING" Elements: **Surface Information** - Displayed information/ Label/Nomenclature/ Symbolism/Associations - Design patterns/"Icons" **"Outer Interface" Elements** - Casing/Skin/ Cover/Container/Shell/ Top Layer - Ergonomics **Inner ("Gut") Elements** - Control Unit ("CPU") - Engine/"Guts" - Transmission (Forces/Fields) - Working tool - Joints/Connections/ Limbs/Interfaces - Processes - Functional Interactions/ Multi-level Relationships - "Free" space or layer(s)			
"OUPUT" Elements: - Outputs/Uses/ Applications/Functions - Behaviour - Side effects			
"ENVIRONMENTAL" Elements			
"CREALOGICAL" (Similar) SYSTEMS			
SUPER-SYSTEM(S)			

Bipolarity is embedded in the concept of *multi-polarity*. If "different" is interpreted as "opposite" in the original formulation of the *principle of multi-polarity*, the expression becomes, *"Every object is the same and opposite."*[39] This latter formulation is regarded as the **principle of bipolarity**[40], which is a special and normative interpretation of the *principle of multi-polarity.* An example of the *principle of bipolarity* is the existence of light as a wave and particle. The concepts of *unity of opposites (dialectical tension)* and *physical contradictions (dilemmas)* are strongly related to the *principle of bipolarity.* All *bipolar objects*[41] and consequently, *all physical contradictions (dilemmas)* may be expressed as a *paoism* in the basic format:

"[word] is [opposite word] is …"

The **evaporating cloud or conflict resolution diagram** in the *Theory of Constraints* provides another means of depicting *physical contradictions (dilemmas)* that are derived from an (organisation's) objective.[42]

Hirshberg (1999) comments that living with ambiguity is essential for innovative thinking. The (normative) statements of the principles of bi- and multi-polarity are purposely ambiguous. They embody concepts of object equivalence, dialectical tension, uniqueness, oneness (unity of opposites), and "infinity in all directions."

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[39] In theory, an object could be defined by positive space as well as by negative space; see, for example, Edwards (1995).

[40] An interpretation of the *principle of bipolarity* leads to the concept of **"bipolar (dualistic) objects."** Light is a *bipolar object*, since it could be regarded as both a particle and wave. A *bipolar object* is an artefact or *naturfact* that demonstrates and resolves a *physical contradiction (dilemma)*. Consequently, a *bipolar object* contains apparently paradoxical, self-contradictory, dualistic, or opposite properties on the one hand and inherent **"unity of opposites" principles** on the other hand. Examples of *bipolar objects* and principles include the following: magnet (unity of positive and negative poles); telescopic antenna (unity of short and long); invisible ink (unity of absence and presence). Many gimmicked apparatus and utility gimmicks in magic are *bipolar objects* that embody principles for resolving *physical contradictions (dilemmas)*. A few magic gimmicks may be regarded as **multi-polar objects**.

[41] *Bipolar objects* at a strategic level include the following: maxi-mini objectives and strategies; win-win strategies; "necessary conditions" in a *conflict resolution diagram (Theory of Constraints)*. When using a *physical contradiction* to describe a *bipolar object*, its mutually exclusive states should refer to a common criterion or variable.

[42] Implicit in the *evaporating cloud or conflict resolution diagram* is the assumption that at the heart of an (organisation's) objective is a *physical contradiction*. In fact, any objective of system could be broken down into bipolar (dialectical) sub-objectives and variables such as "increase variable(s)" vs. "decrease variable(s)"; "maxi-mini strategies"; "strengths" vs. "weaknesses"; "forces for" vs. "forces against"; "advantages" vs. "disadvantages"; "desirable" vs. "undesirable"; "positives" vs. "negatives." The concept of bipolarity links the *Theory of Constraints' evaporating cloud (conflict resolution diagram)* with *USITs qualitative change graph*. A "static (mutually exclusive) bipolar situation" may be graphically presented using an *evaporating cloud*. In contrast, a *qualitative change graph* may be used to illustrate a "dynamic (mutually exclusive) bipolar situation."
There are several articles, e.g., in the TRIZ-journal, that deal with the relationship between the *Theory of Constraints (evaporating clouds*) and tools of TRIZ; see Mann, D.; Stratton, R. (2000) *Physical Contradictions and Evaporating Clouds* in:
http://www.triz-journal.com/archives/2000/04/b/index.htm
as well as Domb, E; Dettmer W. (1999) *Breakthrough Innovation in Conflict Resolution – Marrying TIZ and the Thinking Process* in:
http://www.triz-journal.com/archives/1999/05/b/index.htm

4.2 Other Macro-Tools

It is being increasingly recognised that a person's ability to successfully deal with novel and complex tasks increases with the level of that person's engagement in thinking about thinking (meta-cognition) and learning about how to learn (meta-learning). From my experience, I would add meta-ideas management (managing ideas about ideas management) to meta-cognition and meta-learning. At an institutional level, meta-ideas management encompasses knowledge management. However, the discussion in this article focuses on personal ideas management.

Ideal SuperSmart™ Learning assumes that personal **knowledge maps** and level of understanding are greatly enhanced by regular activities of meta-cognition, meta-learning, and meta-ideas management as well as structured intuition, analysis, and reflection. The latter approach recognises the role of intuition in learning and especially draws on tools for meta-cognition and meta-learning. People have models and assumptions about meta-cognition, meta-learning, and meta-ideas management. In fact, people are bounded by such models and assumptions, particularly if they are implicit rather than explicit. Ideal SuperSmart™ Learning therefore focuses on making explicit our models so that we could reinforce, expand, and/or transform them. No doubt, how we think, learn, and manage ideas affect the quality of our cognitive and physical outputs.

Meta-cognition, meta-learning, and meta-ideas management are briefly discussed below from two perspectives: *utopic and practical ideality* on the one hand and an *ideal object* on the other hand. Due to the scope of this article, humans are considered to be the principal agents as well as recipients of meta-cognition and meta-learning. Nevertheless, these cognitive processes and especially meta-ideas management could be enhanced using technology.

Ideal meta-cognition refers to a process that involves constantly thinking about thinking under *(internal) conditions of ideality*. All strategies and conditions of *utopic ideality*, which are listed in table 1, relate to ideal meta-cognition. Criteria for *practical ideality*, however, could be selected with respect to the resources that are required for the domain- or subject-specific task, to which meta-cognition should be applied. My general strategies and criteria for moving towards *ideal meta-cognition* include the following:

- *ideal ("functional") nothingness*: thinking about as well as observing "nothingness"[43] and minimalism

- *ideal "infinity"*: using versatile thinking and B.E.A.R. strategy; trying to devise *IVY-objects*

- *ideal efficiency and "automaticity":* trying to resolve physical as well as *technical contradictions (dilemmas);* regularly observing and trying to apply the following principles: self-regulation; self-appraisal or analysis; self-monitoring; reflection; self-critique

- *ideal conflict resolution and unity*: trying to use bipolar principles such as win-win and maxi-mini-strategies; unification of opposites; using improbable thinking and trying to invent magic tricks as well as routines; thinking about impossibilities[44]

- *ideal simplicity, variety, and beauty*: searching for simpler and more elegant situations; adding variety, asymmetry, and "unusuality" to situations; practising structured and unstructured (organic) *improbable thinking*; "beautifying" situations

- *ideal identification/detection*: observing as well as classifying patterns, anomalies ("unusalities"), and causes in situations; trying to identify *bi- and multi-polar objects* as well as *IVY-objects* in real life

For a specific task, the process of *ideal meta-cognition* involves a **hierarchy of reflection**[45] as follows:

- Level 1 - Occurrence of task: **Reflection-in-action**
- Level 2 - **Reflection on action**, i.e., reflection on *reflection-in-action*
- Level 3 - **Reflection for action**, i.e., reflection and planning for similar tasks in future

Like in ideal meta-cognition, **ideal meta-learning** involves constantly learning about how to learn under *(internal) conditions of ideality*. In *ideal meta-learning*, learning becomes a way of life and a lifelong activity. In some cases, learning may become an obsession, albeit a positive one! Activities for ideal meta-learning include learning about how people learn to observe and solve problems, learn to create or design objects, and learn to manage ideas. Criteria for *ideal meta-learning* include self-learning; self-monitoring and regulation; self-directed creativity; autonomous problem solving; holistic ideas management. In short, an **ideal meta-learner** is synonymous with an "IVY-student" (from the perspective of *utopic ideality*) or a highly motivated and self-managed learner (from the perspective of *practical ideality*).

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[43] See, for example, Barrow (2000). Books on Zen philosophy also focus on the concept of nothingness.
[44] See, for example, Barrow (1999) and Boden (1996).
[45] See Brockbank & McGill (1998); Cowan (1998).

In Ideal SuperSmart™ Learning, the main models for enhancing meta-learning are the **Problem-Situated Learning and Transformative (PSLT) Game**, **Pyramid Model of Understanding**, and **Versatile Matrix of Strategies for Problem Solving and Creativity**. The *PSLT game* is shown in Fig. 2. This model emphasises *problem-situated learning* and synthesises ideas from Laurillard's *conversational framework*[46], Kolb's *learning cycle*, Bigg's *SOLO taxonomy*, and Schön's *reflective practitioner*. The *PSLT game* could be used as a model for illustrating processes of learning, teaching, and reflection, for example in TRIZ and other problem solving methodologies.

A key assumption of the *PSLT game* is that *practically ideal learning*[47] involves a learner recursively or "conversationally" experiencing a loop that consists of three modes of learning: **expository learning, (theoretical) problem solving learning, and experiential learning**. In addition, a facilitator – preferably, a more knowledgeable person ("expert") – enhances learning. When a learner's knowledge base is small, the preferred cycle or loop for a given task is from *expository learning* through *(theoretical) problem solving learning* to *experiential learning* and back to *expository learning*. As shown in Fig. 2, recursive relationships exist between the various modes of learning.

A more knowledgeable learner may "short-circuit" the loop by directly proceeding from a given task to the experiential level. The learner could then focus on experiential and other modes of learning as the learner thinks appropriate. Facilitation for more knowledgeable learners could take place in a team of peers and/or through an "expert." Mastery of a subject occurs when a learner creates a dense network of *knowledge maps* and skills by repeatedly as well as recursively going through the loop of expository, problem solving, and experiential learning. It should be noted, however, that the *PSLT game* focuses on individual learning. The basic notions of the *PSLT game* could be applied to team (group) learning but a different order of interpersonal dynamics operates in environments of *collaborative learning*.

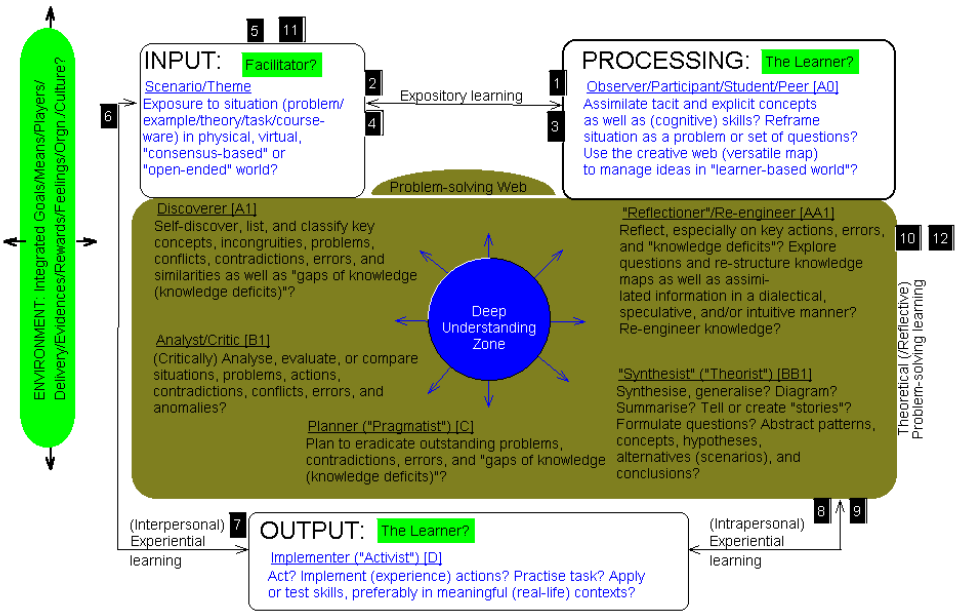
Any learning task could be structured according to the *PSLT game*. For example, learning creativity could be structured as follows: "expository creativity"; "problem solving creativity"; "experiential creativity"; "reflective creativity." Similarly, the learning or teaching of TRIZ might be structured as "expository TRIZ"; "problem solving TRIZ"; "experiential TRIZ"; "reflective TRIZ."

The **pyramid model** distinguishes four levels of understanding:

- Level 0 – Little or "no" understanding
- Level I – Low-order understanding ("novice" learner)
- Level II – Intermediate-order understanding
- Level III – High-order understanding (advanced learner or "expert")

[46] The numbers in the *PSLT game* refer to activity labels in Laurillard's *conversational framework*.
[47] Problem-situated learning assumes that people learn best in the context of real-life problems and experiences rather than in abstract and decontextualised situations such as in textbooks.

Fig. 2: Problem-Situated Learning and Transformative (PSLT) game



The Problem-Situated Learning and Transformative (PSLT) Game (Copyright 2002. Dr. R.K.King)

The *pyramid model* describes the evolution of a learner's understanding using the concepts of *"knowledge deficit", "potential higher-order knowledge map"*[48], and *"multiple-cycle learning*[49]*."* Also suggested in the *pyramid model* are pedagogy-based mechanisms[50] for transforming a learner's existing *knowledge map*, i.e., moving a learner's understanding from one level of understanding to another.

A novice learner has loosely integrated or "stone-heap" *knowledge maps*. In contrast, an advanced learner or expert possesses tightly integrated or densely networked *knowledge maps*. The more loops a learner makes through the recursive cycle of *expository, problem solving, and experiential learning*, the tighter is the knowledge map and the greater is the potential for ascending the pyramid of understanding. Together with the *PSLT game*, the pyramid model could be used for planning as well as devising learning strategies, especially for novel areas of study such as in TRIZ and conjuring.

[48] The concept of "potential higher-order knowledge map" is based on Vygotsky's "level of potential development" and "zone of proximal development"; see Vygotsky in: Kolb, 1984.

[49] *Multiple-cycle learning* basically means going three or more times through the loop of the *PSLT game* and consequently, ascending the *pyramid model of understanding*. *Single and double-cycle learning* are stages towards *multiple-cycle learning.*

[50] Pedagogy-based mechanisms include the following: self-discovery; facilitator(s); peers; scaffolding; "contingent controlled" prompting; suggestions; modelling; structuring.

The *versatile matrix* of strategies for problem solving and creativity is an integral part of the *versatile map*™, which is discussed in section 5.3. The *versatile matrix* is presented as table 4. This matrix may be used to identify deficits in strategies and techniques for meta-cognition as well as meta-learning. The matrix may also be used to select alternative strategies and techniques for problem solving as well as creativity.

Ideal meta-ideas management deals with two main aspects of ideas management: managing physical records (*records management*) and managing the processing, storage, and retrieval of ideas (*knowledge management*). The focus of this article is the management and processing of ideas at a personal level.

One of the tools in Ideal SuperSmart™ Learning, which deals with personal ideas management, is **object mapping**. *Object mapping* is based on the *principle of object equivalence* and incorporates the B.E.A.R. strategy. On an *object map*, everything – an element, a system, or supersystem - is regarded as an "object." *Object mapping* integrates the tools of mind mapping, concept mapping, cluster mapping, and "natural language mapping." Thus, all graphic and textual tools of ideas processing as well as principles of memory management are welcomed when using *object mapping*. Another useful tool for constantly recording and managing ideas is an *idea log or journal.*

Structured Intuition, Analysis, and Reflection (SIAR) is the operational philosophy for problem solving, creativity, and ideas management, especially when information is sparse. Tools for meta-cognition, meta-learning, and meta-ideas management are strongly linked to the approach of SIAR. The SIAR approach assumes that intuition, analysis, and reflection should be carried out within a structured framework, especially using higher-level templates. The main tools for applying the SIAR approach include *mindstorming (brainstorming)* as well as the *versatile map*, *creative web, IVY-template,* and *IVY-matrix of bipolar variables, dimensions, and criteria*. These latter templates are discussed in more detail in part II of this article.

Next month, parts II and III of this article on the Theory of Ideal SuperSmart™ Learning will be presented.

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About the author

Dr. Rodney K. King

www.supersmartnetwork.com

r.k.king@supersmartnetwork.com

* Meta-inventor
* Inventor/Author of many items including the following:
  Theory of Ideal SuperSmart™ Learning;
  Versatile Thinking™ (including PAO Thinking™ and Versatile Map™);
  Six Colored Eyes
* Developer/Teacher of "S-TRIZ"
* Conjurologist
* Civil Engineer; Infrastructure Planner; Regional Development Planner
* Problem Solving, Creativity, and Ideas Management Consultant/ Facilitator