

The Integration and Strategic Use of TRIZ with the CPS (Creative Problem Solving) Process

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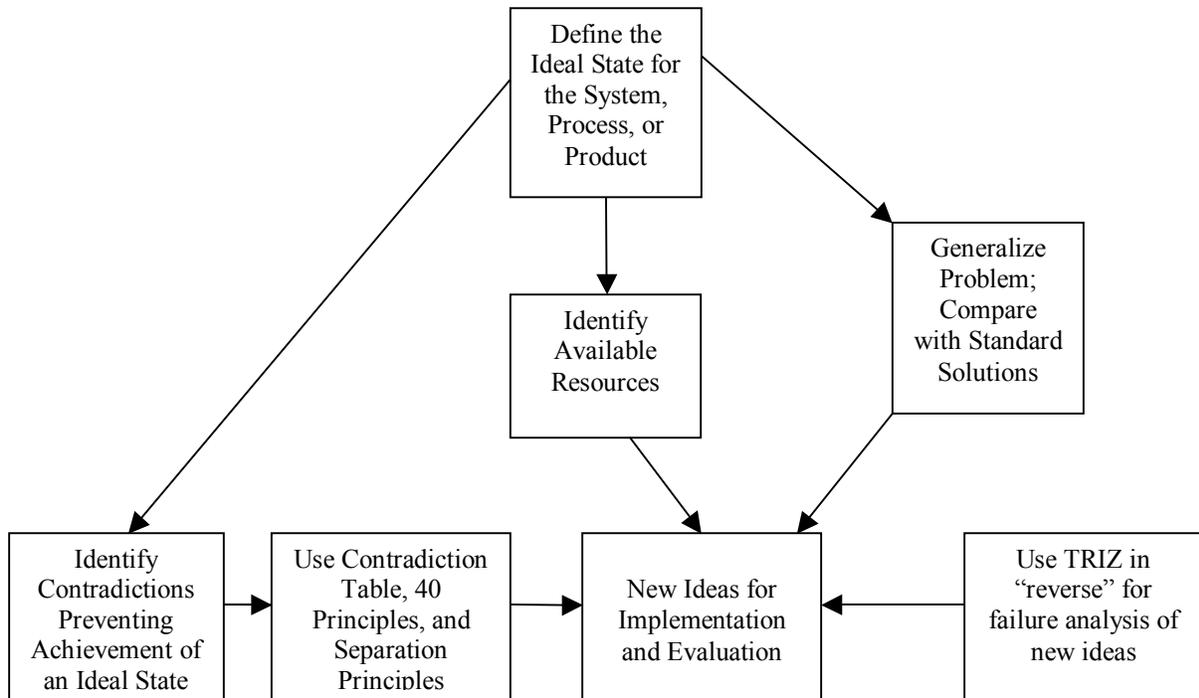
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When the TRIZ Inventive Problem Solving process and its tool kit are introduced into an organization, they invariably encounter a host of processes and tools already in place. While it has been relatively easy to integrate TRIZ with other enterprise tools such as Six Sigma (which have no inherent problem solving capability), it has been more difficult to co-ordinate TRIZ thinking with other psychologically based creativity and assessment tools. Users and trainers for these various tools tend to be very protective about each process and do not spend sufficient time thinking about ways to integrate or understand the value of all tools. In previous papers and presentations⁷, this author has reviewed the integration of TRIZ with DeBono's Six Hats™ and Lateral Thinking™ processes at previous TRIZ conferences (ETRIA, 2001) and in the TRIZ Journal (2/ 2002). This paper will review suggested ways to effectively integrate TRIZ innovation and problem solving principles specifically with the Osbourne-Parnes Creative Problem Solving process, frequently known as CPS.

Prior to the structuring of TRIZ by Altshuller and his associates, all of the improved creativity and inventive processes were based on psychological stimulation—changing the thinking patterns and attitudes already existing within the problem solving group in an attempt to generate ideas that were not seen earlier by these same individuals. These techniques bring no additional knowledge into the innovation session, but attempt to stimulate the knowledge already present within the problem-solving group.

It is assumed that readers of this article know the basics of TRIZ, but suffice it to say that TRIZ is a structured (“left brained”) approach to inventiveness and problem solving whose basis is that most problems we encounter have already been solved in a generic sense. There are a limited number of inventive solution principles and thus the focus of TRIZ problem solving is to model a problem in a basic, fundamental way and then to use the previously described principles (which apply to all inventive solutions) to solve it. An outline of one view of the basic TRIZ (not the more in-depth ARIZ algorithm) process is shown in Figure 1. As with TRIZ, there are different opinions and choices about the sequence and choice of how the various tools in the tool kit are used.

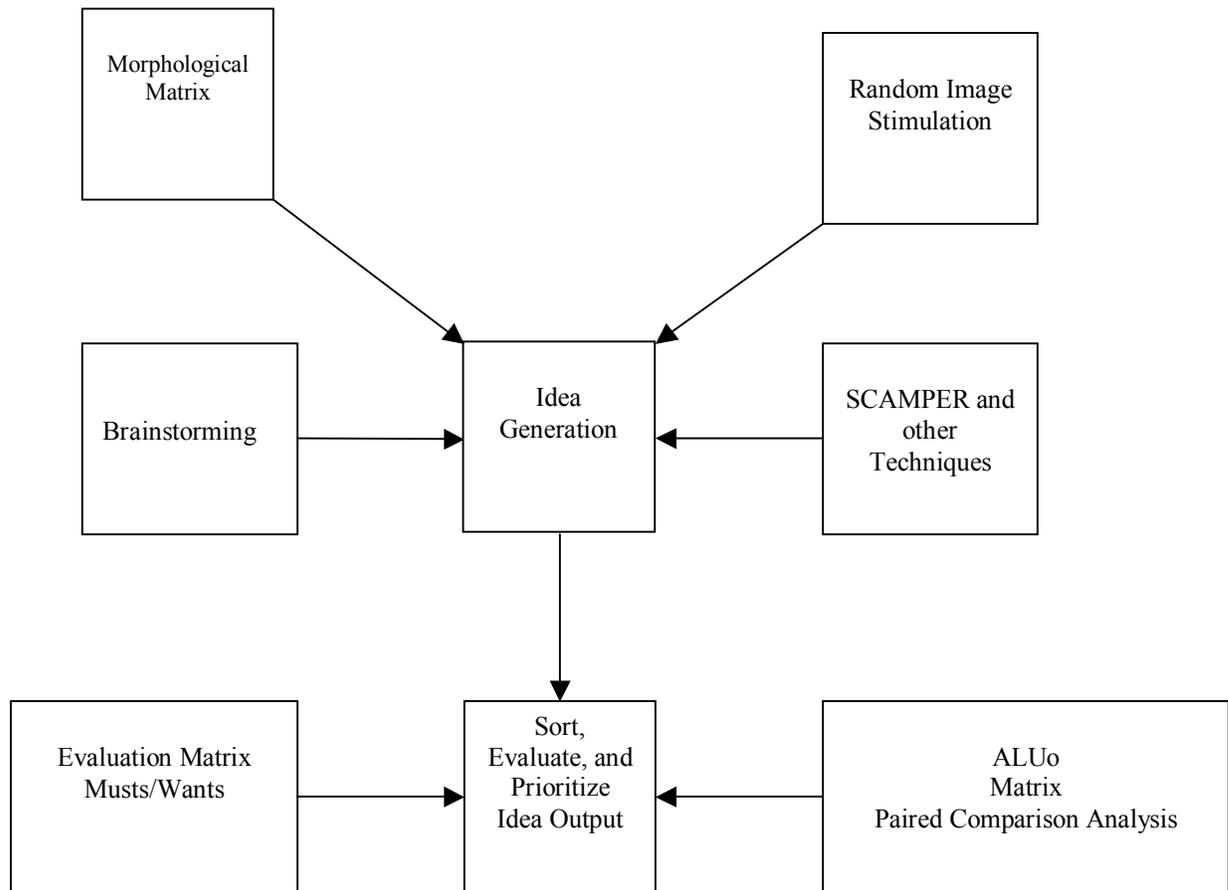
Figure 1
A View of the Basic TRIZ Process



Creative Problem Solving (CPS)

Creative Problem Solving (CPS), first developed in the 1950's by Alex Osborne, was an attempt to improve the simple process of brainstorming. An overview of one practiced version of this process is shown in Figure 2.

Figure 2
The Basic CPS Process



Summaries of the process and the various tools in its tool kit are available⁶. The major improvement made by CPS compared to the general “brainstorming” process, was to separate the idea generation phase of the process from the idea evaluation process in order to maximize the number of ideas generated and not allow idea criticism in parallel with idea generation to overly restrict the final output of a creativity session. The number of ideas generated in a CPS session is a primary measurement of success used by many CPS facilitators. The assumption here is that the more ideas generated, the more likely it is to generate the “best” ideas for further pursuit. The separation between idea generation (the divergent phase) and idea combination, critique, and evaluation (the convergent phase) allows the generation of ideas without fear of criticism or preliminary evaluation from other participants. This process, over time, has also developed a number of idea generation tools to improve the quality of the ideas produced during the divergent phase⁶. One of the fundamental differences between CPS and TRIZ is that TRIZ does not insist on a linkage between the need to generate a large quantity of ideas to generate the “optimum” solution. TRIZ has the capability to produce an optimum solution without the need to generate and analyze a large magnitude of original ideas.

Looking at more detail of the various aspects of the CPS process:

Idea generation and divergent phase--- using brainstorming (assisted by many supporting resources such as image stimulation). Another CPS tool is the use of the SCAMPER idea generation (Substitute, Combine, Adapt, Modify, Eliminate, Put to other Uses, Reverse) tool, used as a specific idea stimulation tool. For example, how could we substitute for this part or function? A morphological matrix, where a few basic properties of a system or product are varied deliberately, can also be used to stimulate ideas. An example of a morphological matrix is shown in Figure 3. Each major attribute of the system under consideration and the group lists possible parameters or characteristics of each parameter. Randomly combining each of the entries of the matrix can generate a large number of ideas.

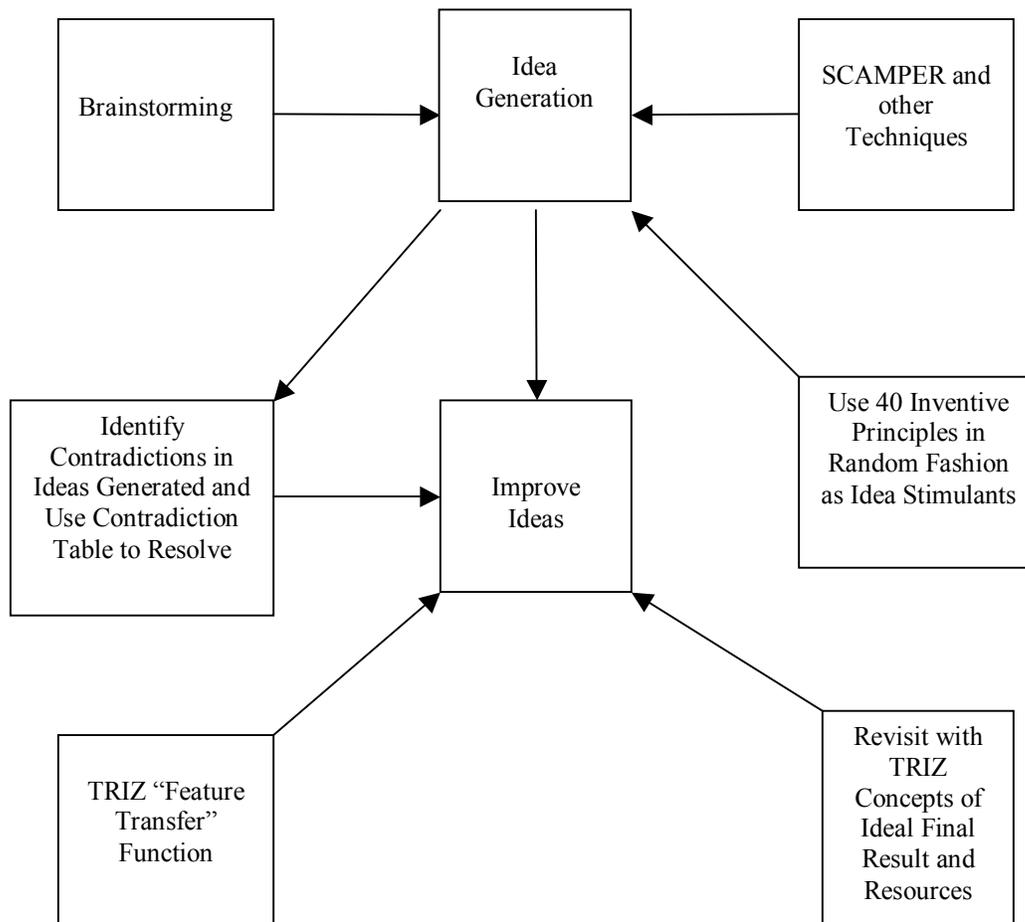
Idea analysis and convergent phase--- Once a list of ideas has been generated by the divergent phase of the CPS process, these ideas are narrowed and focused by a number of different tools

- Focus and evaluation--- use of an evaluation matrix, comparison against criteria, prioritization against absolute needs, etc.
- Idea analysis using ALUo—this focusing tool asks the participants to analyze each idea in terms of its Advantages, Limitations, Unique qualities, and overcome limitations to assist in idea optimization, prioritization, and selection.
- Idea Evaluation Matrix—this tool lists the ideas selected for final evaluation against evaluation criteria established by the problem solving group or its organization. In a table, the ideas are listed vertically and the criteria listed horizontally. At each intersection, a rating or relative ranking is made, assisting in the final decision making of the group.

Using Creative Problem Solving (CPS) as an Umbrella for the Use of TRIZ

CPS can be used as an “umbrella” under which to incorporate many of the simple TRIZ problem analysis and problem solving tools, if desired. (Figure 3).

Figure 3
A CPS UMBRELLA FOR TRIZ



The details of this overall diagram and structure will now be discussed.

TRIZ and CPS professionals both respect separation of the idea generation from the idea evaluation phase of an innovation process. In fact, TRIZ consultants frequently make a point of noting individual statements said during a problem solving session, such as “that won’t work because...”, to illustrate and take note of a contradiction for later consideration. TRIZ adds more emphasis on the problem definition aspect. In the idea generation phase of CPS, the emphasis is on quantity of ideas on the assumption that the ratio of ideas generated to potentially valuable ideas is a constant. TRIZ argues that a well defined problem eliminates the need for a high ratio of ideas generated to useful ideas, but if this is the desired goal, this is how TRIZ principles can be used to improve the CPS process, assuming that it is the overriding general process to be used.

TRIZ Tools for the CPS Idea Generation Phase

A simple way to introduce part of the TRIZ tool kit into CPS is simply to use the original 40 principles randomly or each of the 40 principles on a Post-It™ note and distribute them among the group and ask for ideas via that stimulus as part of a brain writing exercise.

The SCAMPER idea generation tool mentioned previously has some strong overlaps with parts of the TRIZ tool kit. For example, asking the “E” question “eliminate? I.e. can we leave it out? Have fewer parts? Make it lighter, shorter, etc. are all examples of questions that would be asked by a TRIZ facilitator while focusing on the question of “resources” (which from a TRIZ perspective is a much larger list). Similarly, the SCAMPER “A” question relating to “Adapting” (What could I copy? Does the past offer a parallel?) would allow a knowledgeable TRIZ participant to suggest a more formal review of parallel industries that might have similar problems. The “R” question is a restatement of one of the basic TRIZ principles, “do it in reverse”.

TRIZ Tools for the CPS Convergent Phase

The ALUo analysis, previously described, will generate a list of limitations to which the TRIZ contradiction table, 40 principles, and separation principles can all be applied, as opposed to simply brainstorming solutions to the problems identified. The CPS evaluation matrix is an excellent tool for graphically displaying contradictions. The TRIZ tools used for contradiction resolution, 40 Principles and separation principles can be used to analyze and attack these contradictions. Paired comparison analysis is similar to a TRIZ technique (not mentioned previously) called “feature transfer” where we ask what good features of a known good idea (or one good aspect of an overall poor idea) can be transferred to another idea to make an overall better idea. The CPS process of identifying why a particular idea does not meet the criteria, can be supplemented with TRIZ problem solving tools to improve the suggested ideas.

Figure 4
Idea Generation Morphological Matrix⁶

Overall Product Framework or Challenge

Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Value A	Value A			
Value B	Etc.			
Value C				
Value D				
Value E				
Value F				

Concept: Each value is combined with all other values to generate an idea

In summary, when TRIZ is entering an organization already using the Creative Problem Solving process, it can take its first steps toward adoption by using the CPS framework as an umbrella to introduce a number of the unique TRIZ problem analysis and problem solving tools. As its tools become better known and their credibility established, curiosity about the entire TRIZ process will generate interest in the entire TRIZ algorithm and tool kit.

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