Integrating TRIZ with Other Business Processes

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This will be the last of the articles in this 12 part series of columns discussing the use of TRIZ principles alongside business and innovation processes and assessment tools. The list of these is too long to be covered in any short paper, let alone a long one, and when writing about this subject it is inherent that someone's favorite process or assessment will be left out. I apologize in advance if your favorite "other" tool is left out. No offenses are intended, but use the thought that I am trying to convey in the context of the business process or personnel assessment tool you prefer.

One of the major irritations that I see with customers is their frustration with TRIZ experts who do not recognize the value of other approaches and processes. TRIZ is not a complete enterprise process and its integration with other enterprise tools that already exist is imperative.

One might argue about this, but I believe it is fair to say that the most widely used enterprise processes in use today to achieve process excellence are Six Sigma and Design for Six Sigma (DFSS). Both grew out of a desire to systematize our approach to quality and to virtually eliminate defects in a manufacturing process (Six Sigma) as well as the design of products and their manufacturing process (DFSS). Each of these has its own process steps, geared around understanding what the key variables are that affect variability in a system or in a product's performance and controlling that variable so that defect rates are virtually zero, virtually eliminating the need for inspections, rework, and warranty expenses.

Let's look at some of the key steps in Six Sigma and how TRIZ technology can assist. An acronym frequently used in the Six Sigma world is DMAIC (Define, Measure, Analyze, Improve, Control). If we look at the application of TRIZ tools under this umbrella we find the following linkages:

Define: The definition of a problem in Six Sigma is frequently focused around reducing variability or improving functionality. In TRIZ, we spend an incredible amount of time (via functional modeling, substance field modeling, or similar techniques) defining what the problem is as we know that frequently the problem we are presented with is not the real problem. Using our TRIZ modeling tools in this area is a real plus. In addition, the concept of Ideal Final Result (IFR) in TRIZ assists the Six Sigma practitioners in thinking through the result that is truly desired. Problem owners, thinking that their problem is not really solvable in a total sense, compromise the desired result. Now Six Sigma and TRIZ approaches can assist in solving any problem, the IFR concept can challenge the definition of the result desired and cause some serious re-thinking of the problem. A process that does not exist cannot have variability! Maybe the variability is caused by preceding processes and by eliminating them, or their variability, can eliminate errors down stream. This impact of TRIZ thinking is not unique to Six Sigma analysis, but can be especially helpful. As TRIZ practitioners know, getting a client to envision and state the Ideal Final Result is not easy-people cannot imagine a result without a process or some piece of equipment, or a function that may not be needed.

Measure: How we measure things is greatly affected by our backgrounds, experience, and training. Chemical engineers want to do chemical analyses, mechanical engineers want to measure stress and movement, and electrical engineers want to measure current and voltage. These may or may not be the best way to measure the process results and variability. Many of our TRIZ tools relating to "effects" and the knowledge of how other fields measure certain phenomena is very useful. We can force creative thinking here by asking a process owner to think about how someone in an unrelated field might measure the same variable, or we can use an effects data base available in many TRIZ software products or on line at several TRIZ websites. It is also a good idea to bring in the IFR concept and ask how the process might measure itself!

Analyze: We know as TRIZ practitioners that analysis of a problem in a fundamental way frequently provides the answer to the problem. We can assist the Six Sigma process by using our problem analysis tools such as cause and effect and Su-Field modeling. If problem owner is familiar with Theory of Constraints, this leap is a small one.

Improve: In this step, virtually all of the tools in TRIZ can be utilized, including not only the IFR vision, but also the TRIZ resources analysis. As we know, there are literally hundreds of unrecognized and underutilized resources within and around a system-this line of thought can often turn up unique, inexpensive ways of achieving the Six Sigma result. We need to consider the resolution of contradictions rather than the compromise around them. The 40 Principles and separation principles come into play here. We also need to consider the lines of evolution to help push our thinking into the next generation of thinking. How can we use the simple concept of trimming to identify potential breakthrough areas?

Control: Again, all the TRIZ tools are useful here and the idea of the process controlling itself needs to be our driving mental thought. It is very easy for engineers to add measurement devices and control loops to processes. It is more productive and cost efficient to use information the system is generating (including the defects!) to control the process rather than measuring something new.

DFSS uses the approach that if we design an optimum process or product to start with, it will perform at a Six Sigma level and not need later problem solving to achieve Six Sigma. Since we are typically involved with a new product or process, rather than an existing one, the steps are a little different.

Planning: What is the purpose of the product or process? Without TRIZ hats on, we need to assist our clients and ask what function is being performed or is desired to be performed. This is a very different question than "what should the new process or product look like?" This latter question often presumes an initial concept based upon what products the company makes or what expertise it possesses. It could be that we design a process to manufacture a certain product whose function is not needed or that can be performed with other elements within the process (Trimming!). Cause and effect or Su-Field modeling can also be of assistance here in diagramming and understanding what function this new product or process is to perform. Doing this with customer input in some way is absolutely critical.

We can also use the TRIZ 9- Box analysis tool (or 27 box if you like) to make sure we are looking at the systems above and below our proposed systems or products. It may be that what we are proposing could be displaced by a customer who has figured out how to eliminate (trim!) our product. And of course, the TRIZ lines and patterns of evolution can assist us in making sure that we are thinking about the next generation product or process in a structured, complete way. A DFSS project based around the use of a chemical or mechanical field without thinking about how an electronic or magnetic filed might be used is a recipe for disaster.

Concept, Design, and Optimization: The use of all the major TRIZ tools is required and suggested here as well. No doubt the original concept of process or product still has some cost issues. What are they? Are they the result of designs that compromise performance by adding complexity? Are all the internal and external resources being used? Can additional trimming thinking be used to achieve an even more elegantly simple design? Have we looked at all the contradictions that remain? What do the Lines of Evolution tell us about what the next generation of product or process might look like? Can we integrate these thoughts into the current concepts, allowing us to leapfrog competitors?

Some of the same overlaps can be used in the supplementation of the QFD (Quality Function Deployment) process. The basic house of quality that is used in this process highlights the contradictions in product characteristics and these can be approached with the contradiction resolution tools of TRIZ. Getting customers to express their needs and desires in functional rather than industry jargon is a key TRIZ contribution in putting together a house of quality diagram. Using trimming to analyze empty boxes in a house of quality is also useful.

Let's now take a look at some other widely used "soft" organizational tools. The most widely used creativity processes in organizations today are various versions of the Osbourne-Parnes Creative Problem Solving process (CPS) and Edward DeBono's Six Hats process. The TRIZ Journal (www.triz-journal.com), the special Creativity and Innovation Management issue on TRIZ (March, 2005), and the Innovation-TRIZ website, www.innovation-triz.com, contains useful material on TRIZ integration with these processes and there is not sufficient space in this paper to duplicate this existing material, so let's look at some highlights.

The CPS process basically is a divergent/convergent process with some initial problem definition, thought not as rigorous as TRIZ (this is where adding TRIZ concepts to this process can be a real help-consider functional modeling and using functional terms). The major premise of the CPS process is that only a small percentage of ideas generated will be valuable, so the objective is to generate a huge number of ideas that will be evaluated. This is a highly inefficient process (though may be a lot more "fun" than a TRIZ session!) and this distinction is a major source of disagreement between CPS and TRIZ specialists (most of whom have never seen or used the other process). The emphasis in TRIZ is to define the problem in such a way that it is not necessary to generate a thousand ideas to find the best one. If we can define the problem properly, there is an existing problem solution model that can be used in an analogic fashion. CPS practitioners simply do not believe the underlying concept of a limited number of general problem solutions. If it is necessary to combine these tools in a diplomatic way, it is better to simply inject the TRIZ tools of Ideal Final Result, functional modeling, and contradiction

definition into the problem definition phase, and then use the 40 principles and separation principles as idea stimulants to improve the quality of the ideas generated.

When the convergent phase comes (evaluating the ideas generated), use the resource and lines of evolution tools to assist in evaluating and optimizing ideas. If a Pareto type of evaluation is being used at the end, consider the injection of the TRIZ concept of feature transfer. At the end of the session, use the lines of evolution to suggest next generation concepts.

Another widely used creativity tool is Edward DeBono's Six Hats™. This process has many overall similarities to CPS (emphasis on quantity and psychology), but tries to overcome a major problem with CPS (and other) random idea generation processes and that is the natural human behavior to evaluate ideas (with our biases) prior to their complete study. For example, if a corporate expert in technology ABC criticizes someone else's idea in the same field, this could stop the further consideration of that idea. Six Hats™ separates the parts of the idea generation and evaluation process in a very strict way that improves its productivity. There hats are:

1. Blue (discussion of the meeting and idea generation process itself)
2. Green (the generation of ideas without evaluation or criticism)
3. Yellow (discussion of what is good about an idea)
4. Black (discussion of what is bad about an idea)
5. Red (emotional, gut feel reaction to an idea without necessarily any facts or data)
6. White (discussion of what facts are, what information is needed to evaluate an idea)

These hats are arranged in specific ways depending upon the nature of the problem, length of time available, and other possible variables. Previous Altshuller meeting proceedings have the author's previous papers on this subject. A paper in the March 2005 Creativity and Innovation Management special TRIZ issue can also be consulted (please consult with author for a copy). A brief summary of integration of TRIZ principles with this process is as follows:

Blue hat - use functional modeling to diagram the meeting and decision making process

Green hat - use Ideal Final Result, contradiction resolution tools, effects examples

Yellow hat - use IFR, 40 principles-how can this idea be made even better?

Black - use the "reverse" TRIZ thinking (Predictive Failure Analysis™) to identify potential failure routes

White - what resources have we not considered? What effects are available and are not used?

There really is no TRIZ equivalent to the emotional red hat, since it is based solely on emotion and gut reaction.

Again, it may be far more productive to blend TRIZ tools within this overall framework when starting and gain interest in the TRIZ tools and algorithm, its scientific basis, and how it is typically used. A hybrid approach is better than no use of TRIZ at all!

Final Homework: Identify an alternative creativity process used by your company or one of our customers and identify how to use the various tools within its framework.

It's been a pleasure sharing with you over the past year my thought on the use of TRIZ on the "soft" side. As the TRIZ process and utilization improves and increases, the robustness of its structure and tools continues to be demonstrated. This is just one aspect of this evolution. I welcome your feedback and experiences that my readers have had in the use of TRIZ in management and organizational problem solving.

™Six Hats is a registered trademark of APTT Acknowledgment
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