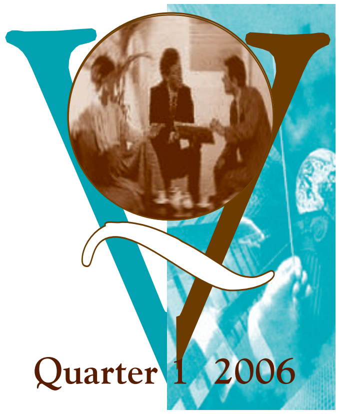

THE PIVOT PALETTE

A quarterly publication of PIVOT Management Consultants

MISSION

Be a premier provider of management consulting services to industry in the high technology, manufacturing / design, services, healthcare, education and government fields.

Be the best partner a business leader can have to help accelerate the move along the path of continuous quality improvement and quality system enhancement, rethinking and changing the way our client's business is done internally and for the marketplace and industry our client serves.

Implement operational improvements across all functions and levels of our client's organization to achieve improved strategic and marketplace position, delivering value added measurable results.

Provide a positive, rewarding, collaborative work environment within PIVOT that fosters personal growth, fulfillment and success for our associates, suppliers and clients.

VISION

Together we will. . .

Work to fully understand the requirements of our jobs, the requirements of our clients and the systems that support us.

Provide error free services, analysis information, education and skills training on time to our clients.

Practice ethical, honest and fair behavior in our interactions with clients, associates and suppliers. We will not promise anything we cannot honestly deliver.

Inspire trust and respect by our clients, associates and suppliers, through PIVOT's proven commitment to our mutual success.

Have fun!

CASE STUDY

Save $30 Million Using TRIZ with Six Sigma

The Dow Chemical Company has been building on its strong history of TQM and traditional quality improvement methods by incorporating Six Sigma tools for both process improvement and new product/process development (DMAIC and DFSS). In the last few years, they have been using TRIZ (systematic innovation) in their R&D efforts, and have combined it with Six Sigma methodologies for some fantastic results!

In 2003, a Dow Plastics business found itself responding to meet the ever more rigorous needs of a cost-driven marketplace. It convened a group of technical experts to redesign its "most effective" standard process - technology for manufacturing facilities. To stay competitive in costs, they needed to drastically reduce the capital required to build future plants. These requirements seemed greatly constraining, calling for lower energy use, better ergonomics for operating personnel, and lower monomer residuals in product. The process to produce this product was several decades old and the technology and equipment systems were considered highly optimized. Needless to say, paradigm paralysis (also called psychological inertia) prevented the design team from seeing new possibilities.

To break their mental freeze, the design team combined their knowledge and application of Six Sigma with TRIZ. Two fundamental TRIZ concepts were used extensively:

1. *Somebody, someplace, has already solved your problem, or one very much like it. Creativity is finding that solution, and modifying it to work in your situation.*

2. *Eliminate contradictions. This is strongly related to the basic Six Sigma and TQM precept of finding the root cause, and removing the root cause, rather than dealing with the symptoms of the problem. Especially in engineering, the concept of trade-offs is so deeply rooted that people don't even realize that using trade-offs means accepting a bad solution to the problem. The classical tradeoff is*

when A gets better, B gets worse…

The Dow team made substantial use of the 40 inventive principles (refer to the article later in this publication to better understand this concept) to eliminate contradictions and give themselves a fresh look at the system.

They assembled a dozen options (using a morphological box at the high) and using a selection matrix helped narrow the choices to four. Detail cost estimations were then able to be developed and measured against the final criteria.

Breakthrough results of this analysis were achieved: improved control of monomer residuals, better handling of raw materials, and an improved reactor design to handle a wider range of heat removals for multiple products. The net result amazed even the project team - capital required to build a new plant dropped by more than 25%, from nearly $110 million to <$80 million!

Tom Kling, the Six Sigma Master Black Belt who incorporated TRIZ into the Dow's DFSS training, says, "Dow has had many successful process improvement projects attributed to integrating TRIZ into Six Sigma, but this was the first time that a whole new factory was designed. It won't be the last!"

To learn more about TRIZ and how to incorporate TRIZ into your Six Sigma, Lean, or other improvement process, see The TRIZ Journal at http://www.triz-journal.com, or to attend a seminar on TRIZ, call us at 909-985-9294 / 877-pivotmc and ask for Ellen Domb.

IN BRIEF

TRIZ Examples

The Candy Company

The Problem: A candy company wants to make syrup-filled, bottle-shape chocolates by first molding the chocolate, then pouring syrup into the mold. To speed up production, the plant manager considers heating the syrup to allow for faster pouring -- but that melts the chocolate and distorts its shape.

Approach to the Conflict: Turning to a TRIZ matrix for help, engineers identify the problem as one of speed vs. shape. They then look up the TRIZ principle it suggests as a source for possible solutions: property transformation.

The Solution: The chocolatiers freeze the syrup in molds and then dip it in liquid chocolate. As the chocolate solidifies at room temperature, the syrup inside melts - the end result is a bottle shaped chocolate with liquid syrup inside!

The Manure Conundrum

The Problem: A by-product for dairy farmers in Chino, CA is the collection of more than 1 million tons of wet cattle dung during the year. To help get rid of the the smell that permeates throughout the neighboring cities and capitalize from it, one farm started using electric ovens to dry its cow patties for transport as fertilizer. But as California's energy prices soared, electric drying became prohibitively expensive.

Approach to the Conflict: Using TRIZ tools, the farmers learned to transform their problem from "How can we dry manure more efficiently?" to "What's the cheapest way to take water out of something mushy?"

The Solution: Searching the global patent database, they found a 40-year-old idea for turning orange juice into concentrate using hydrophilic gas, which bonds to water molecules and bubbles them out. The farm is reportedly building a plant that will use such a gas to dry manure for a fraction of the cost of electric dehydration.

Ford Escort

The Problem: In the mid-1990s, Ford engineers found that when they installed an airbag, the car's steering wheel shook so much while the engine idled that they feared lost sales and increased warranty costs. At first they tried to dampen the vibration by attaching a lead block to the steering column. That helped, but not enough; more weight would have made the column too heavy.

Approach to the Conflict: Can't find a good trade-off between vibration and weight. Try TRIZ principle #6, universality: "Make one component perform multiple functions.

The Solution: Searching for an existing part that could serve as a dampener, the team found one - the airbag itself. By attaching it to the column with flexible connectors, Ford brought the vibration in line with the competition's and even reduced steering-wheel shake when the car traveled over bumps.

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Six Sigma Black Belt - one day a week (160 hours)	Certification available
Lean Manufacturing - Basic & Advanced available	40 hours each
Mistake Proofing	24 hours
Setup Reduction	32 hours
Business Process Mapping / Responsibility Charting	16 hours
Problem Solving Tools (Basic)	16 hours
Time Management	16 hours
Project Management	40 hours
Business Continuity Planning	8-40 hours

Call us about offerings in Spanish.

If you have any comments/suggestions, please contact::
Akhilesh Gulati, Phone: 877-pivot-mc, 909-985-9294
or write to: PIVOT, P.O. Box 536, Upland, CA 91785-0536

TRIZ In A Nutshell

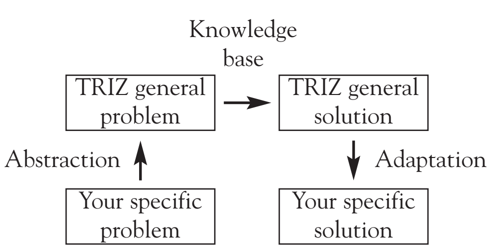
TRIZ (pronounced 'TREES') is the English acronym of Russian translation meaning "Theory of Inventive Problem Solving". Genrich Altshuller and his colleagues developed this methodology for creative problem solving in the former USSR in 1946. It is now becoming more popular and practiced throughout the world.

Genrich Altshuller, a a young patent adviser in the former USSR Navy Office recognized a pattern amongst a huge number of patents he regularly processed. He noticed there appeared to be similar ideas and analogous solutions in different areas, in different eras, and for different problems. He realized that even "original" and "creative" inventions had common patterns and figured that if these principles and patterns of inventions could be extracted and codified, these could be taught to people and every one could become an inventor! Starting in 1946, he formally analyzed a huge number of patents and developed the philosophy of "Principles of Invention" and devised procedures to think of such inventions (he called them "Algorithm of Inventive Problem Solving"). The three primary findings of his research were:

1. Problems and solutions were repeated across industries
2. Patterns of technical evolution were repeated across industries
3. Innovations used scientific effects outside the field where they were developed

Much of the practice of TRIZ consists of applying these findings to create and to improve products, services and systems. It requires learning repeating patterns of problems-solutions, patterns of technical evolution, methods of using scientific effects, and applying the general TRIZ patterns to the specific situation that confronts the developer.

The basic model for problem solving in TRIZ is illustrated in the following figure.



The premise is that trying to solve our own problems individually and concretely is rather difficult and often takes us through trials-and-errors. TRIZ uses a collection of models (or templates) of problem solving, which have been studied and accumulated beforehand. We start by formulating our problem into an appropriate TRIZ model. Then by using the TRIZ knowledge database, find a known solution of the model which we apply, by analogy, to develop our specific solution.

General TRIZ Solutions have been organized in many different ways, some Analytical, some more Prescriptive:

Analytical:	Prescriptive:
• The Ideal Final Result • Functional Analysis and Trimming • Locating the Zones of Conflict	• 40 Principles of Problem Solving • The separation principles • Laws of technical evolution & technology forecasting

Altshuller postulated that, at its core, every technical problem embodies a conflict. Dry the stuff, but consume less energy. Manufacture a powerful engine, but make it lighter. Build a high-capacity hard drive, but make it smaller. TRIZ recognizes that traditional problem solving frequently relies on trade-offs, where one parameter of a system improves but another gets worse. A trade-off is always a bad solution! TRIZ calls this situation a *Technical Contradiction*; e.g., the product gets stronger (good) but the weight increases (bad). TRIZ also recognizes the *Physical Contradiction* where you want to have two different values of the same parameter; e.g. coffee should be hot, for enjoyable drinking, but cold, to prevent burning the customer. A basic precept of TRIZ is to solve the problem, not to accept the compromise.

TRIZ research has identified 40 principles that solve the Technical contradictions and four principles of separation that solve the Physical contradictions. Following the TRIZ problem-solving procedure, we first analyze the problems to formulate a Technical Contradiction, then reformulate it with several steps into a Physical Contradiction, and finally solve it with Separation Principles.

A simple TRIZ example follows:

1. Issue: Copyright marking in moving images
2. Problem: The copyright mark must be seen clearly in order for the mark to work as the clear statement of copyright. On the other hand, the copyright mark should not be easily noticeable by the viewers: it must not be seen. *A Physical Contradiction!*
3. Solution: "Make the mark clearly visible in the static menu selection mode or still movie frame; Make it invisible in the movie viewing mode because of the short duration of display."
   By applying the principle of "separation in time", they implemented the copyright mark "to be seen and at the same time not to be seen".

   Although it appears that TRIZ is useful for solving technical problems , over the years, it has been applied in various fields: business, social issues, architecture, food technology, software development, and technology forecasting. Is there an application of TRIZ in your industry?

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RADICAL THINKING?

THE BIG 'D'!

Big D – the formal decision maker. In today's world of consensus decision-making, talking about a formal decision maker seems to be anachronistic; however when you reflect back on the times when you have participated in consensus decision-making, do you think it was the most efficient process? Was it really effective? Did everyone leave satisfied with the decision?

Lee Iacocoa, once said about consensus decision-making, "Consensus decision-making is when they can all give me their opinions, and then they do what I tell them to." Perhaps this would be viewed as an extreme, but does it not behoove us to define clear decision-making roles in order to enhance organizational performance? We use organizational charts to define the hierarchy, responsibility matrices to delineate responsibility and accountability, then why not a model to help us remove any ambiguity around decision-making.

Good decision-making depends on assigning unambiguous, specific roles. Although this sounds simple, most organizations struggle with this because either 1) nobody feels accountable or 2) too many people feel accountable. In either case, the buck gets passed around. This results in lengthy multiple meetings with no clear decisions.

A recent incident: A Vice President had been assigned a project with relatively clear expectations of the outcome set by the division President. However, when the project team met to discuss the project charter, two people claimed to be the joint project owners (and therefore the inferred formal decision makers - Big Ds) and the two 'Big Ds' could not agree on the charter. This situation was tricky as both the parties were peers in the hierarchy of the organization and both sincerely wanted to make positive change. A lack of clarity and assignment of specific roles can lead to not only a delay in the decision making process, it can also leave the subordinates confused and demoralized.

Many tools exist (e.g. RAID-P) to aid organizations in analyzing the best method for decision-making. They all generically support the concept of assigning roles and involving the relevant people to determine: who provides input, who decides, and who gets the work done. RAID-P specifically identifies five critical decision-making roles: Recommend, Agree, Input, Decide and Perform.

- *Recommend: people in this role are responsible for making a proposal, providing information/data, and conducting analysis to make a sound decision.*
- *Agree: people in this role have the right to vote as well as veto recommendations. Often they generate a debate which generally leads to a modified proposal.*
- *Input: people in this role are consulted on a decision and should ultimately be those involved in the execution.*
- *Decide (Big D): the person in this role (and there is only one) is the formal decision-maker. He/she is ultimately accountable. They have the authority to resolve any impasse, bring the decision to closure, and commit the organization to action.*
- *Perform: people in this role are responsible for executing the decision.*

Lack of clarity about the Big D role can lead to a confrontation between multiple entities and ultimately result in lack of ANY accountability. Want consensus decision-making at its efficient and effective best? Want rapid decision making? Have a clearly specified Big D and associated roles!