

# An introduction to Theory of Inventive Problem Solving (TRIZ)

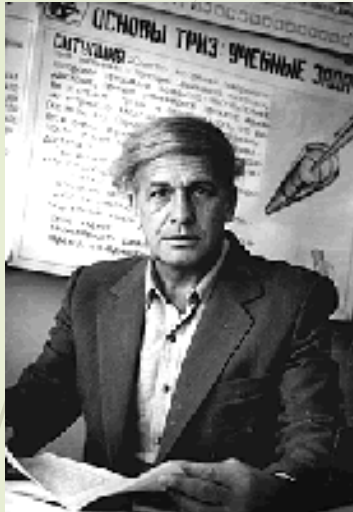
## What is TRIZ?

# Теория Решения Изобретательских Задач

- pronounced as “treez”
- TRIZ stands for  
in russian “Teoriya Resheniya Izobretatel’skikh Zadach”  
in english “Theory of Inventive Problem Solving”

All innovations emerge from the application of a very small number of inventive principles and strategies.

# Genrich Altshuller – the Father of TRIZ



- Discovered and developed by Genrich Altshuller and his colleagues from 1946 through to 1985 in the former Union of Soviet Socialist Republics (USSR)
- It is based on the study of patterns of problems and solutions
- It is a systematic problem solving method based on logic and data, not intuition or spontaneous creativity of individuals or groups

# Key Discoveries

Initial analysis of  
patents  
(worldwide) 200,000



Synthesized  
down to just  
innovative patents 40,000



Are  
mined  
for...



- 1 Problems and solutions were repeated across industries & sciences → **40 Inventive Principles for solving Problems**
- 2 Patterns of technical evolution were repeated across industries & sciences → **Technology Trends to evolve a technical system to the next gen**
- 3 Innovations used scientific effects outside the field from where the original problem was found → **Scientific Effects can be used to solve problems in unique ways**

Today >2.8M patents have been analyzed & investigated

# Advantages of TRIZ

## 1 structured process

- use algorithms to enhance creativity through the scientific application of methods and principles
- used in solving complex technical problems and assist in generating more higher quality solutions in less time

## 2 best practices

- ▀ represents the distillation of the best practices of successful inventors and problem solvers from across many fields of human invention
- ▀ relies on proven knowledge that has been applied time and again throughout mankind's history

## 3 reliable & repeatable

- provide the innovator with reliable and repeatable results - results that do not depend on personal creative ability or psychological techniques such as brainstorming
- promote reuse of innovation principles and strategies



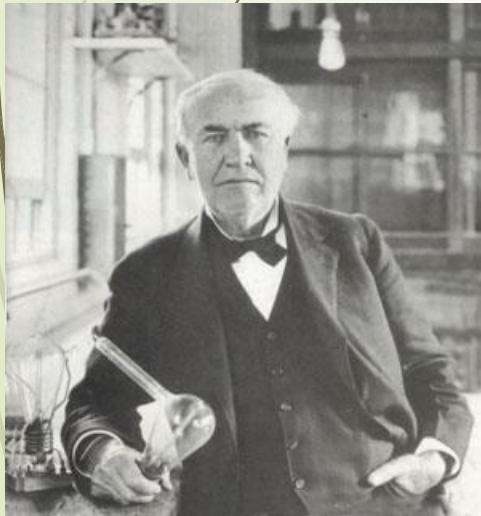
# Why TRIZ?

Trial and error  
problem  
solving  
approach



Structured and  
systematic  
problem solving  
approach

Increase efficiency and speed of innovation



Thomas Alva Edison (1847 – 1931)  
“Genius is one percent inspiration,  
ninety-nine percent perspiration”

In 1879, after spending \$40,000, and performing 1,200 experiments with 5,000 researchers, Edison succeeded in making a light bulb using carbonized filaments from cotton thread. The light bulb burned for two days. The electric light took the greatest amount of time and required the most complicated experiments of all his experiments.

# Sharing TRIZ Successes

MAY 31, 2006  
**INNOVATION**  
By Reena Jana

**BusinessWeek**

## The World According to TRIZ

**Blue-chip American companies are embracing a 60-year-old innovation theory pioneered by a Russian inventor**

Fast-forward to 2006. The list of American companies that have applied Altshuller's recipe for innovation includes Boeing ([BA](#)), Hewlett Packard ([HPQ](#)), IBM ([IBM](#)), Motorola ([MOT](#)), Raytheon ([RTN](#)), and Xerox ([XRX](#)), among others.

**BusinessWeek**

**TECHNOLOGY** December 25, 2008, 12:01AM EST


text size: T | T

## Tech Innovations for Tough Times

How GE and others are using alternative techniques such as TRIZ to make R&D more efficient

By [Steve Hamm](#)

These days, TRIZ is coming on strong at corporations hungry for new ways to improve innovation and productivity beyond what they've already achieved with the widely adopted Six Sigma and Lean techniques. In addition to GE, TRIZ fans include Intel ([INTC](#)), [Samsung](#), and Procter & Gamble ([PG](#)), as well as smaller companies like FuelCell Energy ([FCEL](#)), a Danbury (Conn.) leader in power-generation fuel cells. The company employed TRIZ to evaluate the expensive flanges it uses to join pipes in its generators. After weighing the component costs, effectiveness, and complexity of assembly, FuelCell switched to a new clamping technique that will slash costs by 50%.

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## A Perpetual Crisis Machine

**Samsung's VIP Center is home to a uniquely paranoid culture--and that's the way the boss likes it.**

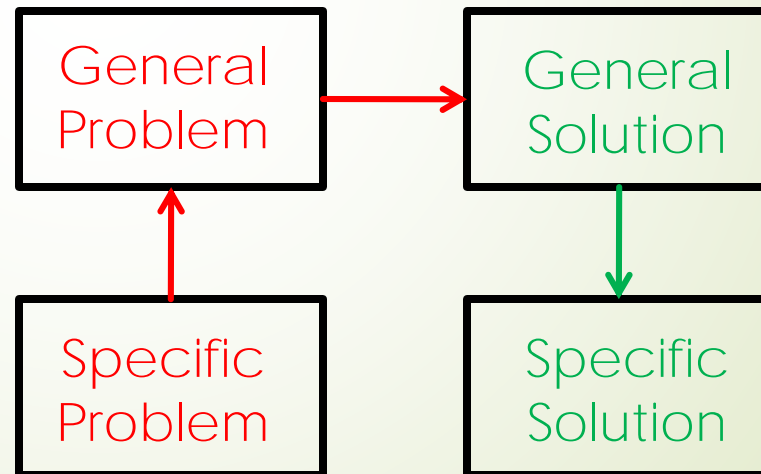
By **PETER LEWIS**  
September 19, 2005

**FORTUNE**

In any event, TRIZ is by no means unique to Samsung; hundreds of companies—including competitors like Philips, LG, and Motorola—use it too. At the VIP Center, however, the goal is to train every engineer and researcher in the company in TRIZ think.

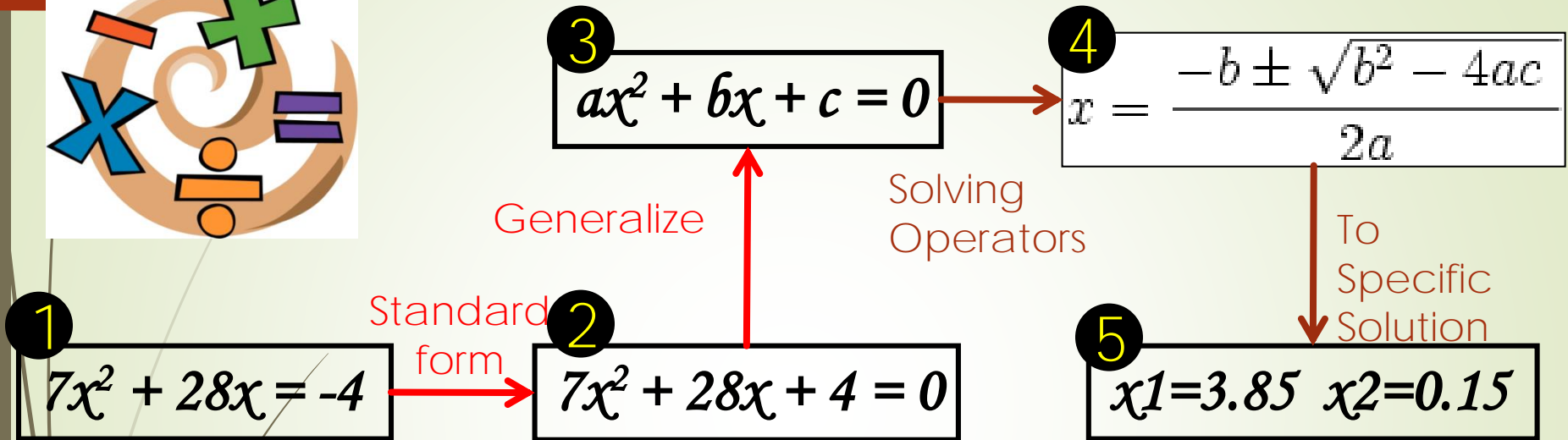
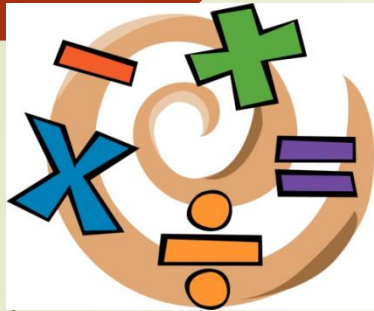
# How does TRIZ work?

Innovative solutions to difficult problems could be found not by probing the nooks and crannies of the right brain but by studying the way others had already attacked similar problems.

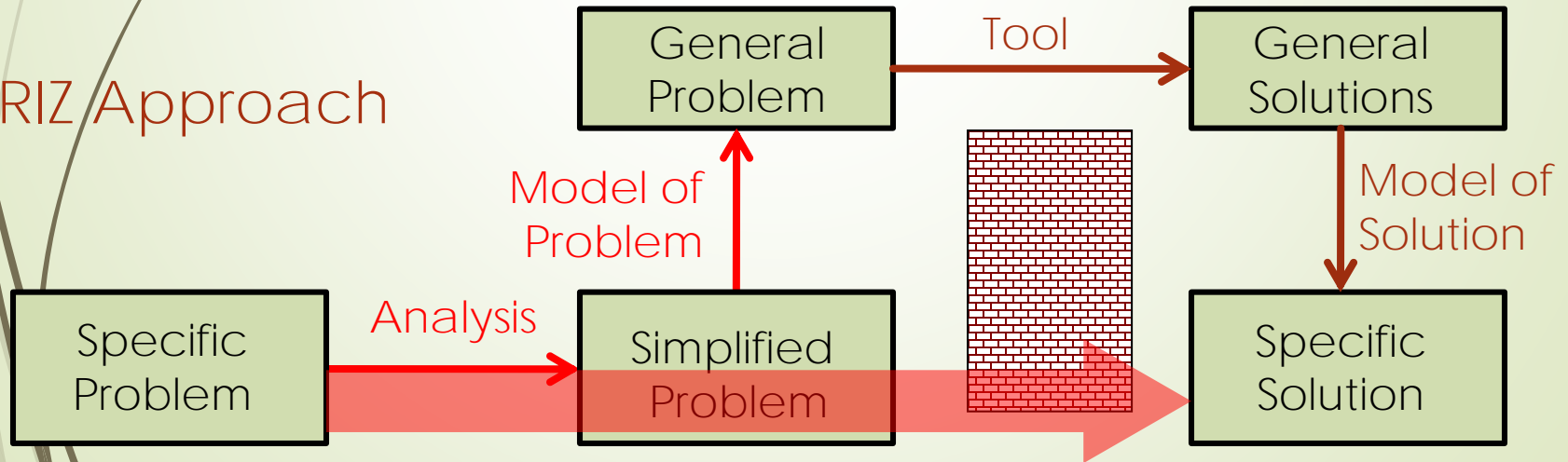




# How do we solve problems?

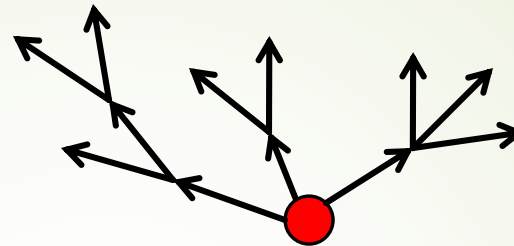


## TRIZ Approach



# Usual ways to solve a problem

Trial and error way



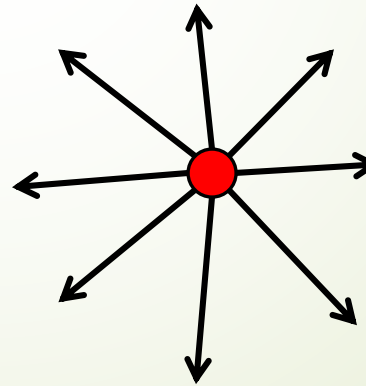
Problem



Solution

Structured ways

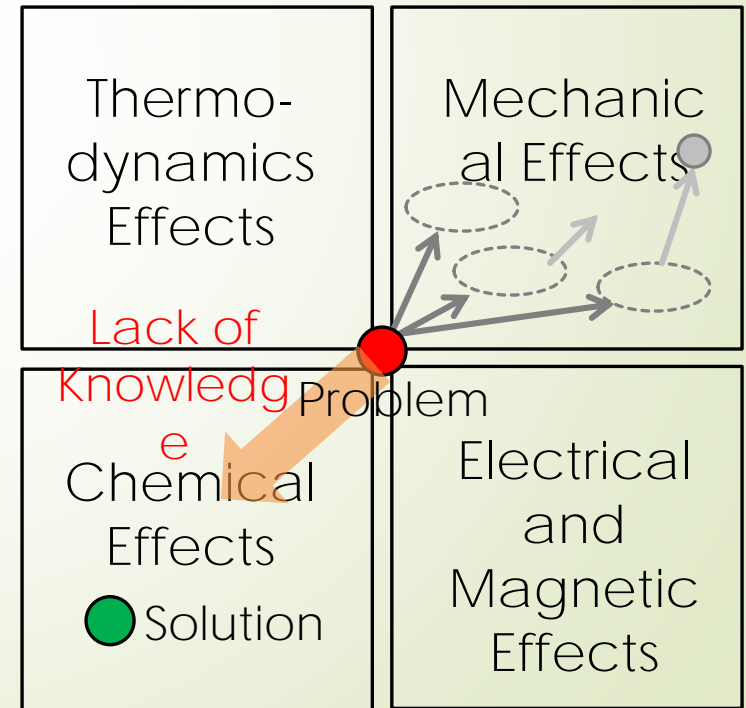
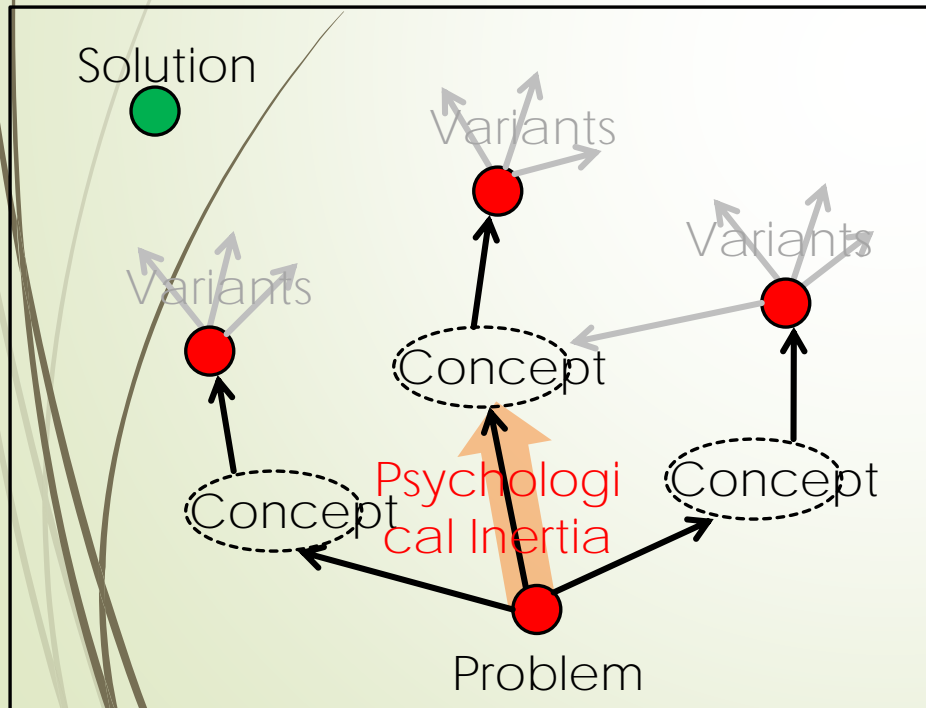
Brainstorming  
Trigger Approach  
Checklist  
Morphological  
Approach  
Synetics  
Etc.



Solution

# Limitation of usual problem solving methods

- Psychological inertia
- Lack of knowledge
- Wrong objective or goal
- Avoid conflict or contradiction
- Don't know actual root cause



# How does TRIZ complement structured problem solving?

structured problem solving process



inventive problem solving process (TRIZ process)

- functional Analysis of product or process
- help to define the real problem to be worked on vs. symptoms
- analyze useful or harmful operational zones to understand the conflicting requirements
- cause and effect chain helps to see other potential causes of problems
- scientific effects database - better understanding of other potential causes
- scientific effects database identify effects that can solve problems
- 40 principles – identify potential solutions
- TRIZ is not better or superior compare to the structured problem solving methodology
- TRIZ complements the structured problem solving methodology, if use together it will bring innovative results

# TRIZ 40 Inventive Principles

Table 4. TRIZ 40 Inventive Principles

1. Segmentation	21. Skipping
2. Taking out	22. Blessing in Disguise
3. Local Quality	23. Feedback
4. Asymmetry	24. Intermediary
5. Merging	25. Self-service
6. Universality	26. Coping
7. Nested Doll	27. Cheap Short-Living Object
8. Anti-Weight	28. Mechanics Substitution
9. Preliminary Anti-Action	29. Pneumatics and Hydraulics
10. Preliminary Action	30. Flexible Shells and Thin Films
11. Beforehand Cushioning	31. Porous Materials
12. Equipotentiality	32. Color Changes
13. The Other Way Round	33. Homogeneity
14. Spheroidality-Curvature	34. Discarding and Recovering
15. Dynamics	35. Parameter Changes
16. Partial/Excessive Actions	36. Phase Transitions
17. Another Dimension	37. Thermal Expansion
18. Mechanical Vibration	38. Strong Oxidants
19. Periodic Action	39. Inert Atmosphere
20. Continuity of Useful Action	40. Composite Structures



# TRIZ as a discipline

Treat innovation as a discipline to be mastered, not as right brain hocus pocus

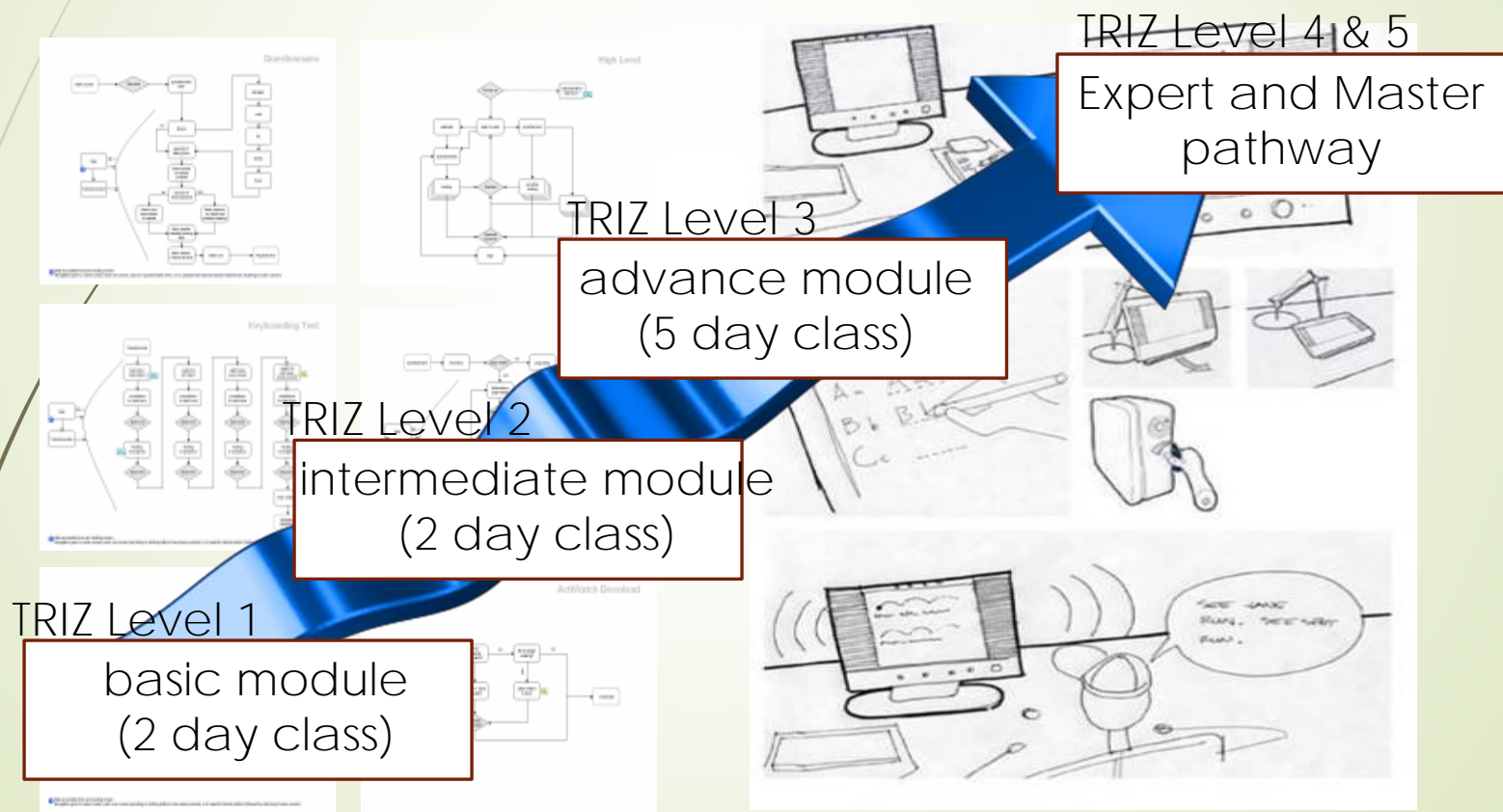
Systematic Problem Solving & Systematic Innovation

If music, arts, dancing, singing, martial arts, etc can be taught, the Innovation Discipline can be taught too

# Where can I learn TRIZ?

- Are you curious about the concept to achieve the ideal stage?
- Are you keen to know the TRIZ process?
- Are you ready to learn the secret of 40 inventive principles?

expertise



time

# TRIZ Tools Overview

## Level 1:

1. Function Analysis (Product Analysis)
2. Cause & Effect Chain Analysis
3. Ideality
4. Trimming
5. Engineering Contradiction
6. Contradiction Matrix
7. 40 Inventive Principles

## Level 2:

1. Physical Contradiction
2. Substance-Field Analysis
3. 76 Standard Inventive Solutions
4. S-Curve Analysis
5. Scientific Effects

## Level 3:

1. Function Oriented Search
2. Trends of Engineering System Evolution
3. Feature Transfer
4. Benchmarking
5. 9-Windows
6. ARIZ
7. Clone Problem Application
8. Super-Effect Analysis
9. Failure Anticipation Analysis
10. Inverse Analysis
11. Process Analysis
12. Process Trimming
13. Flow Analysis
14. Forecasting
15. Perception Mapping

# MyTRIZ Path (<http://mytriz.com.my>)

MATRIZ = International TRIZ

MyTRIZ = Malaysia TRIZ Innovation Association

Practitioner  
Pathway



Instructor  
Pathway

Zero TRIZ knowledge	TRIZ Level 1 (2 days class)	Level 1 TRIZ Practitioner		
TRIZ Level 1 Practitioner	TRIZ Level 2 (2 days class)	Level 2 TRIZ Practitioner	TRIZ Level 1 Instructor (2 days class)	TRIZ Level 1 Instructor
TRIZ Level 2 Practitioner	TRIZ Level 3 (10 days class)	Level 3 TRIZ Practitioner	TRIZ Level 2 Instructor (2 days class)	TRIZ Level 2 Instructor
TRIZ Level 3 Practitioner	TRIZ Level 4 (Application of TRIZ tools)	Level 4 TRIZ Expert	TRIZ Level 3 Instructor (2 days class)	TRIZ Level 3 Instructor
TRIZ Level 4 Expert	TRIZ Level 5 (Research in TRIZ)	Level 5 TRIZ Master		