The 10th TRIZ symposium

# How to Lead Beginners to TRIZ at the Place of Practice?

2014/9/12

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DENSO

# Company Summary



| | | |
|---|---|---|
| Established | | December 16, 1949 |
| Capital | | 187.4 billion yen |
| Net sales | consolidated | 4,095.9 billion yen |
| | non-consolidated | 2,490.8 billion yen |
| Ordinary profit | consolidated | 419.6 billion yen |
| | non-consolidated | 299.3 billion yen |
| Employees | consolidated | 139,842 |
| | non-consolidated | 38,581 |
| Consolidated subsidiaries | | 185 |
| （Japan 62, North America 26, Europe 35, Asia-Oceania 56, Others 6） | | |
| Affiliates under the equity law | | 33 |
| （Japan 13, North America 4, Europe 3, Asia-Oceania 11, Others 2） | | |

There are two non-consolidated subsidiaries

/ As of March 31, 2014

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# Automotive Fields

## Environment

Hybrid and electric vehicle components,
gasoline engine management system,
diesel engine management system,
starter, alternator, radiator, etc.

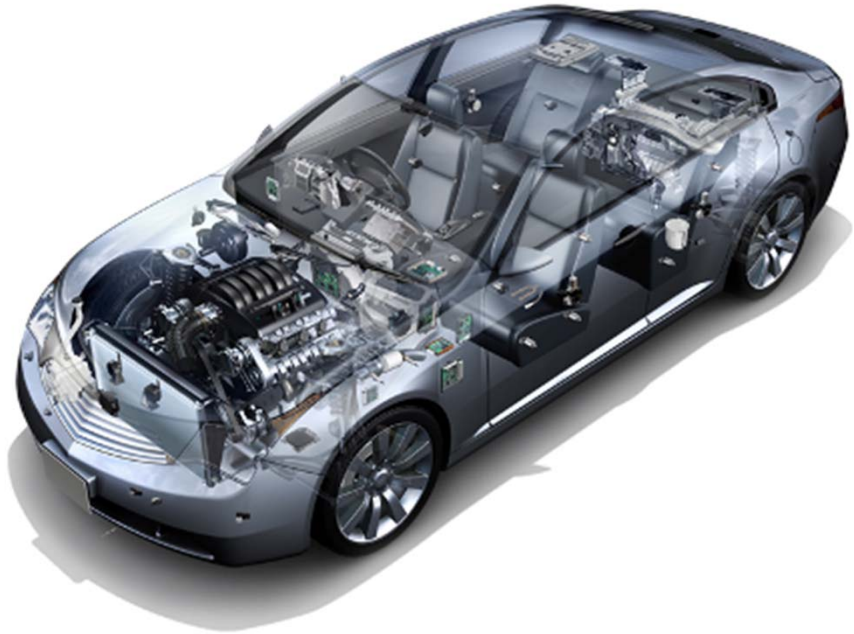
## Safety

Sensing technologies for driving assist systems,
actuator & computer for antilock brake system (ABS) /
electronic stability control (ESC),
adaptive front-lighting system (AFS),
airbag sensors & electronic control units,
periphery monitoring system, instrument cluster,
rain sensor for automatic windshield wiper, etc.

## Comfort & Convenience

Car air-conditioning system,
air conditioner for buses, air purifier,

Car navigation system,
electronic toll collection system (ETC),
remote security system,
remote touch controller, smart key,
advanced vehicle operation system (AVOS), etc.



# Introduction



Our company introduced TRIZ, and ten years or more passed. It can be said that our in-house promotion of TRIZ for ten years came over mainly on practice. In our practice, we first have the users apply TRIZ to the problems of their real jobs, and let them recognize the usefulness of TRIZ. In such a way, we try to make new users and repeaters. Thus we have to assume that most of the people who are applying TRIZ are beginners of TRIZ.

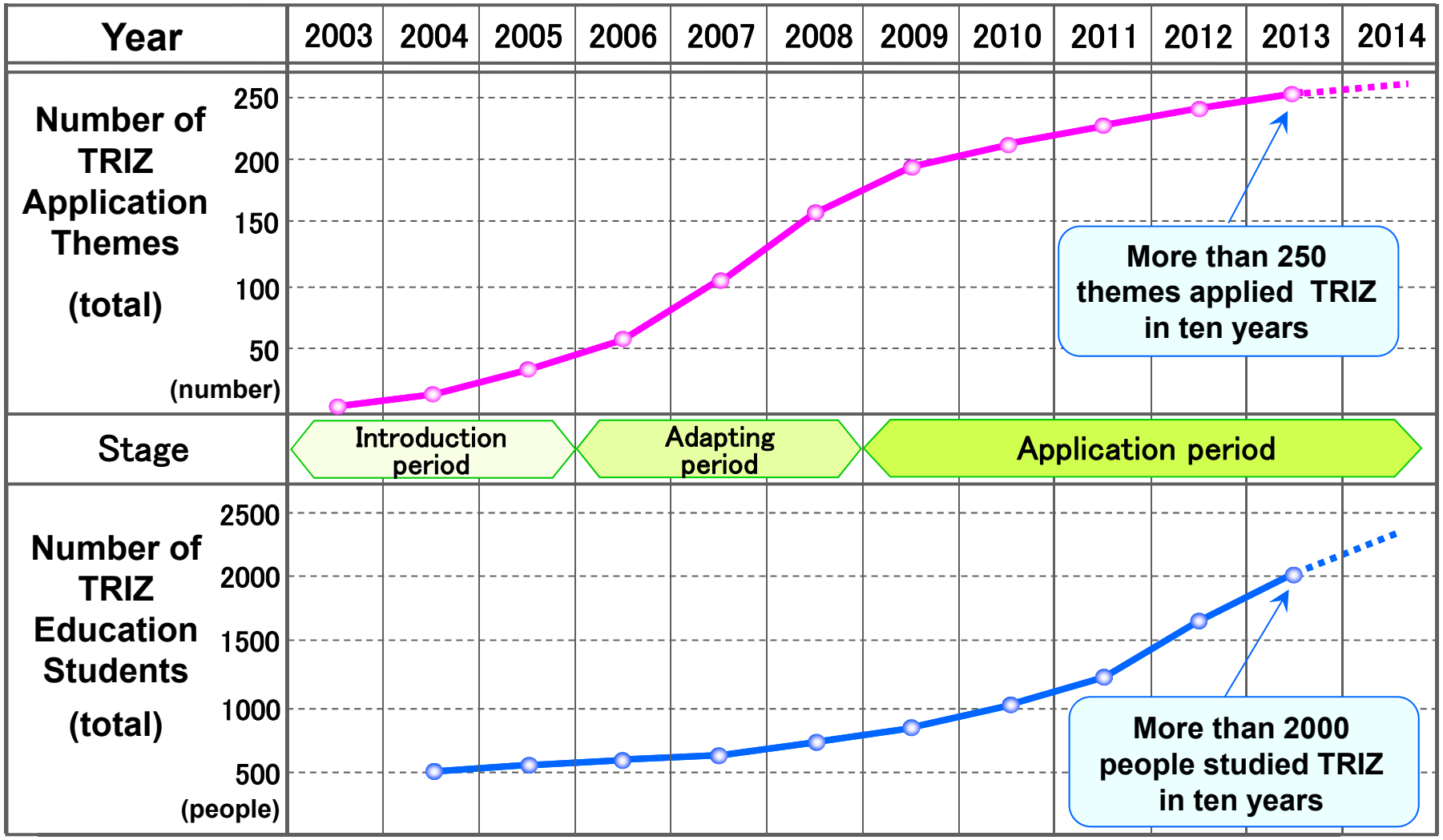
The beginners try to use TRIZ with different motives. When we, TRIZ promoters, select approaches and tools for practice, should select those which match to the themes and even more importantly to the beginner needs.

In the present report we review our 10 years of TRIZ promotion activities to analyze "Successful cases" and "Unsuccessful cases" in a variety of situations encountered so far, and to find "How to lead beginners to TRIZ" in accordance to the beginners' needs.

【 contents 】

# 1. Our TRIZ Development History





# 2. Our report at Japan TRIZ Symposium 2013

## ① Feature of our TRIZ activities

| —Dominant policy— | —Action program— | —Feature— | |
|---|---|---|---|
| Practice First | Problem of real jobs | Various themes | |
| | | In short time | ····· Feature 1 |
| | Try to use TRIZ even without knowing it much | Applicants only | |
| | | Many beginners | ····· Feature 2 |

### Feature 1 : In short time

Formation of activity team

↓

Problem analysis

↓

Idea generation

↓

Concept construction

20h or less

**Compact activities**

### Feature 2 : Many beginners

Leader: I want to use contradiction, which I learned in the introduction class.

Promoter

I heard that TRIZ can generate great ideas.

Team

Is TRIZ a version of brainstorming?

5-6 person voluntary team

**Activity team with many beginners**

# 2. Our report at Japan TRIZ Symposium 2013（2）

## ② For the solution

| —Dominant policy— | —Action program— | —Feature— | —Countermeasure— |
|---|---|---|---|
| Practice First | Problem of real jobs | Various themes<br>In short time | Abundant tools |
| | Try to use TRIZ even without knowing it much | Applicants only<br>Many beginners | |

2013 Report

The themes are classified into 6 categories

Corres-ponding to the themes, add tools

| Category of theme | | Usable tools: Problem Analysis | Usable tools: Idea Generation | Usable tools: Idea Convergence |
|---|---|---|---|---|
| Planning future models | ① Investigate a target | ◆Figure of Genealogy of Technological Evolution | ◆Eight Pattern of Evolution of Technological Systems | |
| | ② Select a target | ◆S-curve Analysis ◆SLP ◆Personification Method ◆DE ◆Evolutionary Potential Radar Plot | ◆Ideal Final Result | |
| | ③ Decide a method | ◆Substance-Field Analysis ◆Problem Hierarchy Explorer | ◆Multi-Screen ◆Physical Contradictio | ◆QFD—TM ◆31 Trends of Technological Evolution |
| Planning next model | ④ Widen a choice of means | ◆Resource Analysis ◆Device Analysis | ◆Reverse TRIZ ◆Goldfire Researcher | ◆Effects Database ◆Prediction ◆KJ Method ◆Pugh Method |
| | ⑤ Decide a mean | ◆Constrain Analysis | ◆Trimming Techniques ◆Technical Contradictio | ◆Portfolio ◆Standard Solutions ◆Making of Definite Plan |
| Problem Solving | ⑥ Short-term Solution | ◆Root Cause Failure Analysis | | ◆40 Principles of Invention |

# 3. Main issues (1)



## ① Matching tool/approach to the theme is not enough.

**Unsuccessful cases we often experienced**

User's impression after the activity

- Though many ideas were desired, too much time were spent for the problem analysis.
- Though I anticipated to try new methods in TRIZ, I was discouraged in the beginning when we were arranged to use the well-known "root cause failure analysis".
- Though I was attracted with the TRIZ way of contradiction solving, I am not certain now, after the training, what was the contradiction in our case and whether we have really solved any contradiction.
- As I worked following the promoter's directions, I was not clear what I was doing and what was the aim of each process.

**Most of unsuccessful cases** ⇒ **Discrepancy between User needs and Tool/approach**

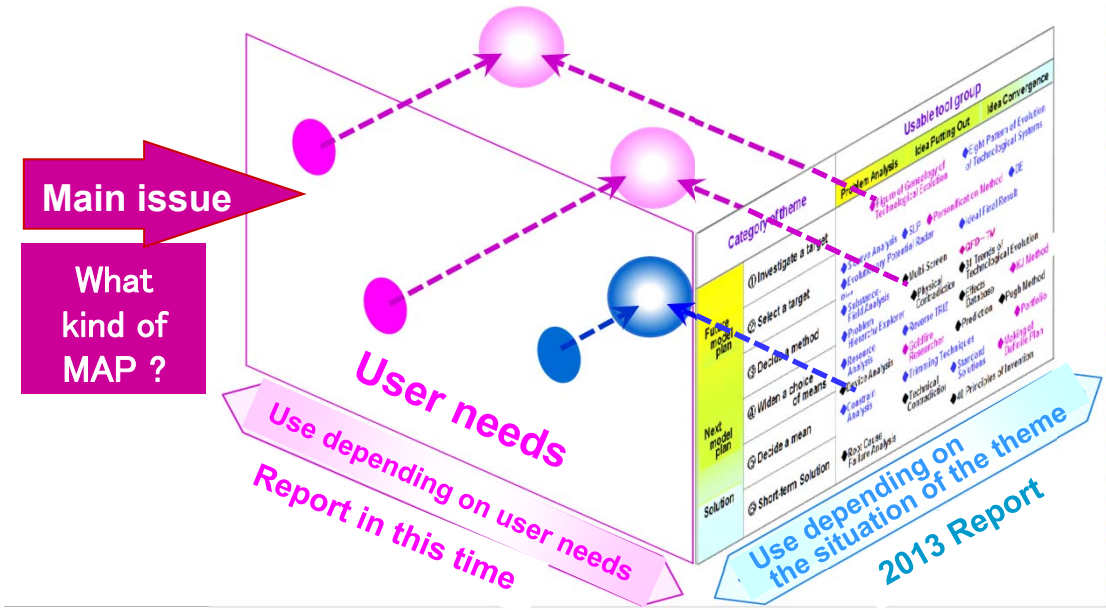
# 3. Main issues (2)



## ② Promoter must well consider User needs

| —Dominant policy— | —Action program— | —Feature— | —Countermeasure— |
|---|---|---|---|
| Practice First | Problem of real jobs | Various themes<br>In short time | Abundant tools (2013 Report) |
| | Try to use TRIZ even without knowing it much | Applicants only<br>Many beginners | User needs (Main issue) |

**We need Tool/approach which match with both the theme and the user needs.**




To make the TRIZ activity successful
( success = result X satisfaction )

Selecting Tool / approach matched with the theme is not good enough.

Necessary to select tool/approach matched to user needs.

Most users in our company are beginners..
User needs ➔ Beginner needs

**How to Lead Beginners to TRIZ at the Place of Practice?** — This report

# 4. Beginners' Needs at Place of Practice (1)



## ① 3 Beginner Needs and 2 Aims often observed at Place of Practice

**= Findings =**

**Beginner needs classified from experience of a lot of practice**

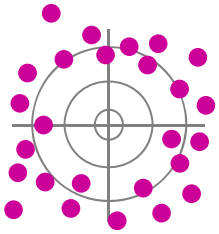
= Three Beginner Needs =

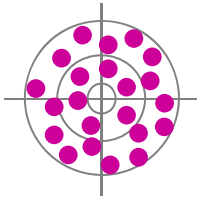
We want many ideas. (divergence / ideation )

We want a definite solution. ( concentration / logical)

We want a ground-breaking idea. ( deep thinking／analysis／conversion )

= Two Aims =





Aims

Out of the Restriction

Within the Restriction

We should have tools/ approaches for these different types of needs

Reviewing many practices, I classified the cases with the categories of 3 beginner needs x 2 aims.

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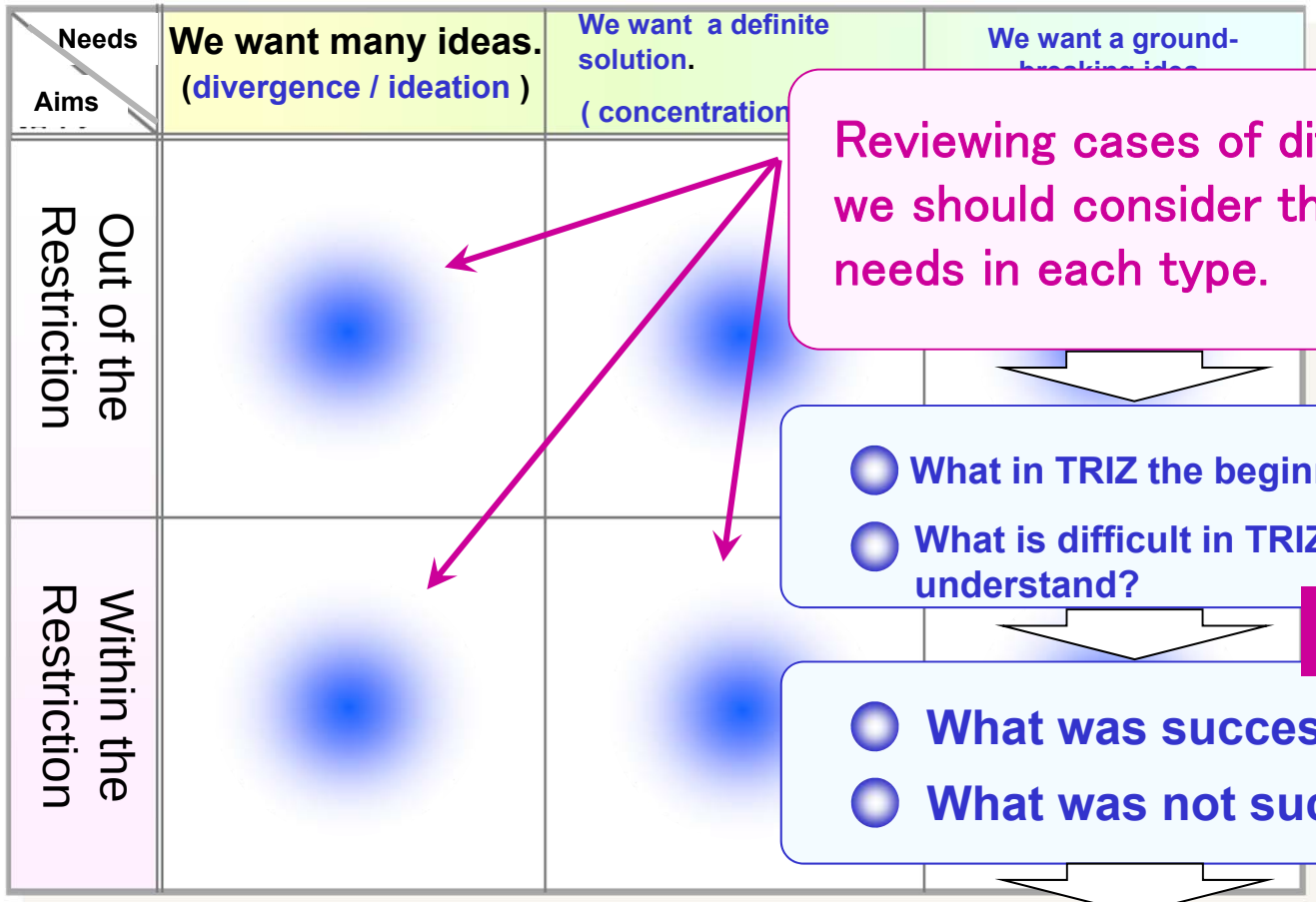
# 4. Beginners' Needs at Place of Practice (2)



## ② Finding Beginner Needs from the Cases

### ＝ Three Beginner Needs ＝




＝ Two Aims ＝

Reviewing cases of different types, we should consider the beginner needs in each type.

- What in TRIZ the beginners are attracted?
- What is difficult in TRIZ for beginners to understand?

**Measures for beginners**

- What was successful?
- What was not successful?

**We can select the tools and approaches suitable for the beginner needs.**

# 5. Beginners' needs revealed by practices



## ＝ Cases of Practice introduced in this paper ＝

| Beginner Needs | Aim | Results | Tool / Approach | |
|---|---|---|---|---|
| We want a definite solution. | Within the Restriction | Successful | Reverse TRIZ | Case ① |
| | | Unsuccessful | Root Cause Failure Analysis | Case ② |
| | | | Finding Root Causes | Case ③ |
| | | | Selection of Characteristic Parameters | Case ④ |
| We want many ideas. | | | 40 Inventive Principles used as a Checklist. | Case⑤ |
| | Out of the Restriction | Successful | 31 Trends of Technological Evolution | Case⑥ |

Beginner Needs → What is attractive? → What is difficult to understand?

Finding the measures for beginners

# 5. Beginners' needs revealed by practices (1)



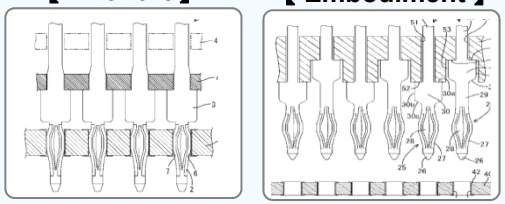
## ① We want a definite solution within the restriction : Cases with Reverse TRIZ

| Procedure of Reverse TRIZ | Guidance: |
|---|---|
| 1 Selection of the patent | The user should select. |
| 2 Presumption of Principles of Invention | Consider all the Principles |
| 3 Definition of Technical Contradiction | Model the problem carefully |
| 4 Selection of Characteristic Parameter | Check all the parameters. |
| 5 Identification of Principle of Invention | Use the Contradiction Matrix. |
| 6 Verification of validity | Evaluate the solution together |
| 7 Contrivance of evasion idea | Think of going-around ideas logically. |

**1** The connector for circuit substrates, and terminal press fit jig

| Patent 396931 | Registration 15/6/2007 | Sumitomo Wiring Systems |
|---|---|---|

【 Prior art 】 【 Embodiment 】



**2** 17 : Another Dimension

**3** 【 Problems 】

Big receiving part — enlarges → Pushing power

Big receiving part — enlargement → Connector

Successful cases

**4**

| Improving Feature | Worsening Feature |
|---|---|
| 10. Power | 3.Length of moving object |

**5**
- 17. Another Dimension
- 19. Periodic Action
- 9. Prior Counter-Action
- 36. Phase Changes

**6** An estimated Principle of Invention and the first one accord.

= Evaluation of the invention =
- Obedient and frontal attack
- The evasion idea is variously considered.

**7**

| | | = Evasion idea = |
|---|---|---|
| 17. Another Dimension<br>19. Periodic Action<br>9. Prior Counter-Action<br>36. Phase Changes | Does not the same way of thinking include another idea? | Direction change, Folding, Pulling |
| | Is there not the idea to solve the same problem by a way of thinking that is different from an inventor? | Pulse applying press fit<br>Prior elasticity deformation<br>Dry ice elasticity deformation |

# 5. Beginners' needs revealed by practices (1)



## ① We want a definite solution within the restriction : Cases with Reverse TRIZ

| Procedure of Reverse TRIZ | Guidance: |
|---|---|
| 1 Selection of the patent | The user should select. |
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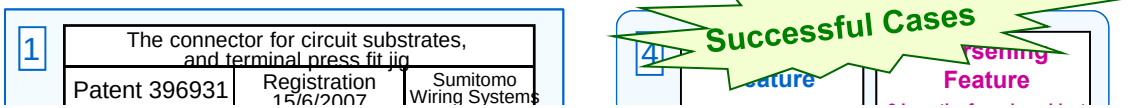
| 7 Contrivance of evasion idea | Think of going-around ideas logically. |




**Attractive points for beginners:**

- TRIZ way of thinking with "Contradictions"
- Possible to 'evaluate inventions'

Tendency

**Advantages of Reverse TRIZ:**

- To understand the usage of Technical Contradictions.
- To understand the aims of each procedure

Measures

9. Prior Counter-Action
36. Phase Changes

solve the same problem by a way of thinking that is different from an inventor?

→ Prior elasticity deformation
→ Dry ice elasticity deformation

**Applying Reverse TRIZ is often successful (especially for patent related projects). Users understand it and are often interested more.**

# 5. Beginners' needs revealed by practices (2)



## ② We want a definite solution: A case of applying Cause-Effect Analysis

**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

### 1 Cause-Effect Analysis

Unsuccessful

**Being in trouble**

Effect | Cause — Deployment

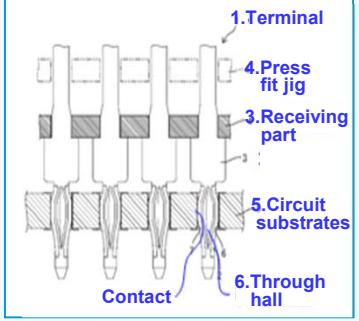
A connector becomes big

- Because the width of the terminal is big
  - Because a terminal inclines → Stop
  - Because the receiving part transforms
    - Because the receiving part surrenders
      - Because aspect pressure of the receiving part is large
        - Because the press-fitting load is large
          - Because this touching elasticity power is large
            - Because the contact load is excessive
            - Because the necessary contact load is large → Higher level ?
              - Because the contact length is short
              - Because the contact resistance is large → Higher level ?
              - Because the difference of the elastomeric force is large
      - Because stress of the receiving part concentrates
        - Because the shape of the receiving part is not suitable
    - Because strength of the receiving part is weak → Stop
      - Because materials of the terminal are phosphor bronze
- Because plural terminals queue up → Stop

To stop the deployment on the way (with decision making )

Higher and lower levels are often confused.

【Prior art】
Terminal for connector



# 5. Beginners' needs revealed by practices (2)



## ② We want a definite solution: A case of applying Cause-Effect Analysis

**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

**1 Cause-Effect Analysis**

Unsuccessful

Being in trouble

A connector becomes big

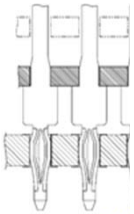
Result

Ca

Stop

【Pr

Terminal



Conta

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**Difficult for beginners to understand:**

- "Cause-Effect Analysis" itself
- Higher and lower levels are often confused.
- To stop the deployment on the way ( with the decision making ).
- For what purpose should we do the Cause-Effect Analysis?

Tendency

Because the contact length is short

Because the contact resistance is large

Because the difference of the elastomeric force is large

Higher and lower levels are often confused.

Higher level ?

**"Cause-Effect Analysis" is not successful when it is pursued too much.**
**( It is not Root-Cause Analysis that the beginners want to do. )**

# 5. Beginners' needs revealed by practices (3)



## ③ We want a definite solution: A case of identifying root cause (1)

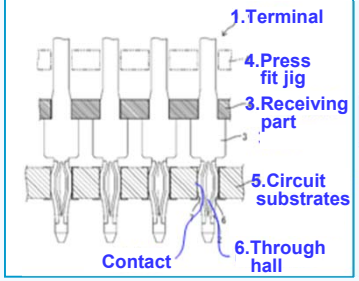
**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

### 2 Identification of Primary Cause

**Being in trouble** — Unsuccessful

【Prior art】
Terminal for connector




= Problem Hierarchy =

- A connector becomes big — Composition
  - Because plural terminals queue up — Terminal
  - Because the width of the terminal is big — Press-fitting
    - Because a terminal inclines
    - Because the receiving part transforms — Transformation
      - Because the receiving part surrenders — Strength
      - Because strength of the receiving part is weak — Primary Cause Candidate — Shape
        - Because stress of the receiving part concentrates
        - Because the shape of the receiving part is not suitable — Primary Cause Candidate — Aspect pressure
          - Because aspect pressure of the receiving part is large — Primary Cause Candidate — Load
          - Because the press-fitting load is large
          - Because this touching elasticity power is large — Contact
            - Because the contact load is excessive
            - Because the necessary contact load is large — Resistance
              - Because the contact length is short — Primary Cause Candidate
              - Because the contact resistance is large — Manufacturing
                - Because the difference of the elastomeric force is large
                - Because materials of the terminal are phosphor bronze — Material

# 5. Beginners' needs revealed by practices (3)



## ③ We want a definite solution: A case of identifying root cause (1)

**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

2 Identification of Primary Cause

Being in trouble

A connector becomes big

Unsuccessful

Problem

**Difficult for beginners to understand:**

- At which level should I identify the Primary Cause in the hierarchy of the problem?

Tendency

- Suggestion to use a minimum problem is not persuasive.
  ( There are cases other than problem solving.)
- Beginners often like higher level thinking.
- Selection of plural Primary Causes often ends unsuccessful.

Tendency

**Identification of the Primary Cause is a decision making, and hence it is difficult to do in the Root Cause Analysis.**

➔ **During the functional deployment (or solution deployment), identification of the root causes is agreeable more easily.**

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# 5. Beginners' needs revealed by practices (3)



## ③ We want a definite solution: A case of identifying root cause (2)

**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
   - 2-2 Function Development
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

**Successful**

**2-2 Function Deployment**

Wanting to come true
Means / Develop-ment

Want to realize:
To reduce the width of the terminal

- Improvement of strength of the receiving part
  - Shape: Wide width / ?
  - Material: Phosphor bronze / ?
  - Jig: Suppre-ssion / ?
- Reduction of the press fit load
  - Press fit method: Spring mechanism / ?
  - **Target Idea**
  - Spring power reduction: Contact area increase / Locking mechanism / Bonding / ?
- Arrangement of terminal: Parallel / ?

**Image of Idea**

**2 Identification of Primary Cause**

- Because the receiving part surrenders
  - Because aspect pressure of the receiving part is large
    - Because the press-fitting load is large
      - Because this touching elasticity power is large
        - Because the contact load is excessive
          - Because the contact length is short
        - Because the necessary contact load is large
          - Because the contact resistance is large
          - Because the difference of the elastomeric force is large
- Because strength of the receiving part is weak
  - Because stress of the receiving part concentrates
    - Because the shape of the receiving part is not suitable
  - Because materials of the terminal are phosphor bronze

**Primary Cause**

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# 5. Beginners' needs revealed by practices (3)



## ③ We want a definite solution: A case of identifying root cause (2)

**Procedure of Technical Contradiction**

1. Cause-Effect Analysis
2. Identification of Primary Cause
   - 2-2 Function Development
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Inventive Principle
6. Generation of solution idea

**2-2 Function Deployment**

Case that went well

Want to realize:
To reduce the width of the terminal

Wanting to come true
Means | Develop-ment

### Function Deployment ( Means deployment )

**Starting with "want to realize", deploy "possible means" step by step.**

- By the function deployment, it becomes easier to make a consensus of target ideas.
- It becomes easier to obtain consensus in the team
- Effective as a tool for decision making.

Tendency

**During the Root Cause Analysis, the team is apt to think multiple choices of root cause.**

➔ **Good to encourage the decision making (focusing on target ideas) by use of Function Deployment.**

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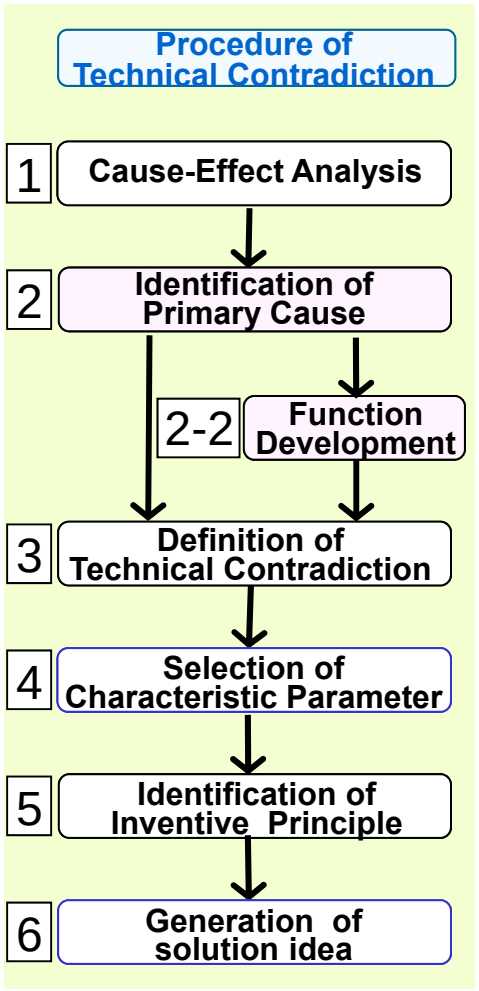
# 5. Beginners' needs revealed by practices（4）



**④ We want a definite idea within the restriction : A case with Selection of Characteristic Parameter**




Unsuccessful

**3 Definition of Technical Contradiction**

**4 Selection of Characteristic Parameter**

Big spring power → enlarge → Contact area → Improving feature：05. Area of moving object

Big spring power → enlarge → Press-fitting load → Worsening feature : 10. Force

## Beginner's Tendency

| Improving feature : 05. Area of moving object<br>Worsening feature : 10. Force | 27. Reliability<br>39. Productivity | 35. Adaptability or versatility<br>32.Ease of manufacture |
|---|---|---|
| 19: Periodic Action | 01: Segmentation | 01: Segmentation |
| 30: Flexible Shells & Thin Films | 35: Parameter Changes | 13: Other Way Around |
| 35: Parameter Changes | 29: Fluids & Pneumatics | 31: Holes / Porous Materials |
| 02: Taking Out / Separation | 38: Strong Oxidants | |

Securing of area ➔ Securing of electric contact ➔ Reliability ➔ Robustness ➔ Adaptability

Power is excessive ➔ Press-fitting is difficult ➔ Productivity ➔ Ease of manufacture

**Beginners tend to think about the background**

# 5. Beginners' needs revealed by practices（4）



**④ We want a definite idea within the restriction : A case with Selection of Characteristic Parameter**

**Procedure of Technical Contradiction**

1. Perform Root Cause Failure Analysis
2. Identification of Primary Cause
   - 2-2 Function Development
3. Definition of Technical Contradiction
4. Selection of Characteristic Parameter
5. Identification of Principle of Invention
6. Contrivance of solution idea

Unsuccessful

**Difficult for beginners to understand**

- **Which Characteristic Parameter should I choose among several candidates?**

**Tendency**

- **Beginners apt to select the Characteristic Parameter having broader concept.**
- **Beginners like to select "…ity" parameters.**
- **Beginners tends to pay attention to "the background" rather than "functions".**

**The promoter should guide (or interfere) the team in the selection of Characteristic.**

➔ **Selection of Parameters with broader concept makes the identification of the Contradiction unclear.**

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# 5. Beginners' needs revealed by practices（5）



**⑤ We want many ideas within the restriction : A case Using the Inventive Principles as a Checklist (1)**

**Beginners are attracted with:**

**Reputation of TRIZ as an idea generation method**

Unsuccessful

Tendency

| Typical Needs | We want many ideas.<br>We want to finish with 2-3 times of 2 hour sessions. |
|---|---|

**Identify the target, and then quickly go ahead to generate ideas.**

**40 Inventive Principles are used as a Checklist.**

**01.Segmentation ➔ 02.Taking Out / Separation ➔ 03.Local Quality ➔ ・・・ ; Generate ideas one by one**

**As many as 5 times of ideas are generated in comparison with the brainstorming.**

**TRIZ has worked nicely as an idea generation method.**

**but** **Not many become the repeaters.** **Different evaluation**

**Some users begin to use TRIZ as an idea generation method.**

**( a simple tool) / (fulfilling an aim of the TRIZ promotion)**

**Many users do not use TRIZ repetitively.**

**(Each of TRIZ principles looks not new.)**

**Darrell Mann**

**2003 versions**

# 5. Beginners' needs revealed by practices（5）



## ⑤ We want many ideas within the restriction : A case Using the Inventive Principles as a Checklist (2)

**Procedure of Darrell Mann 2003 version**

1. Simple Definition of Technical Contradiction
2. Selection of Characteristic Parameter
3. Identification of Inventive Principles
4. Idea Geeneration
5. The Second Selection of Characteristic Parameter
6. The Second Identification of Inventive Principles
7. The Second Idea Generation

**Successful**

1 Want to realize / Worsening feature

- Want to realize: make the terminal smaller
- Thing to lose: Decrease in the contact pressure

2 Improving feature: 07 : Volume of moving object

Worsening feature: 15 : Force / Torque

3 = 9 Principles =

15: Dynamize, 01: Segmentation, 35: Parameter Changes, 03: Local Quality, 36: Phase Transition, 04: Asymmetry, 14: Curvature, 37: Thermal Expansion, 19: Periodic Action

4 Idea Generation

5 Improving feature: 35 : Reliability

Worsening feature: 44 : Productivity

6 = 5 Principles =

35: Parameter Changes, 01: Segmentation, 10: Prior Action, 28:Mechanics Substitution, 29: Fluids & Pneumatics, 32: Color Change, 33: Homogeneity, 14 Principles in total

7 The Second Idea Generation

**Define the contradiction quickly (or simply) and use Darrell Mann's new Matrix , 2003 version.**

➔ More relevant Inventive Principles are suggested, resulting better satisfaction .

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# 5. Beginners' needs revealed by practices（6）

Successful



⑥ We want many ideas out of the restriction :

A case Using 31 Trends of Technological Evolution as a Checklist

**Beginners are attracted with:**

**Reputation of TRIZ**

**to be usable for planning**

| Typical Needs | Tendency |
|---|---|
| We want to make planning of our future products without divergence of thought. | |
| We want many ideas. | |
| We want to finish with 2-3 times of 2 hour sessions. | |

**Identify the target, and then quickly go ahead to generate ideas.**

**31 Trends of Technological Evolution are used as a Checklist.**

**01.Smart Materials ➔ 02.Space Segmentation ➔ 03.Surface Segmentation ➔ ・・・ ; generating ideas one by one**

**Think about the future plan, which was apt to be divergent with the needs, newly from technical viewpoints.**

**TRIZ is effective for idea generation of future products.**

**Beginners are attracted with:**

**Planning from technological viewpoints**

**Instead of: Customer Values ➔ Means ➔ Plan,**

**we think: Technological Evolution ➔ Customer Values ➔ Plan.**

**Nice to start with technological viewpoints for planning.**

**Many become the repeater users.**

**Planning of future products was quite difficult because of allowing arbitrary way of thinking, and hence the application of TRIZ often turns into satisfaction of the team.**

**(TRIZ provides a new viewpoint of technological evolution, and urges to investigate new customer values on the basis of many new technological ideas. )**

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# 5. Beginners' needs revealed by practices（6）



**⑥ We want many ideas out of the restriction :**
**A case Using 31 Trends of Technological Evolution as [illegible]**

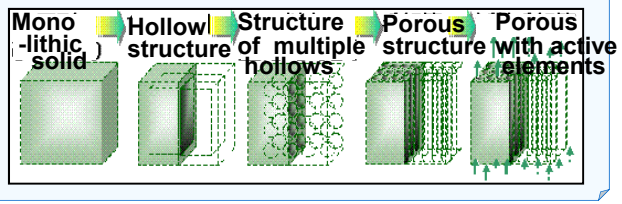
Successful

**Procedure of 31Trends of Technological Evolution**

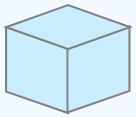
1. Identify a target product
2. Selection of Evolution Trend one by one
3. Identification of Suitable Parts
4. Identification of the Present Evolution Stage
5. Thinking about the Evolution Form
6. Thinking about the Customer Value
7. Selection of Ideas

1. Planning a new product of chewing gum

2. **02. Space Segmentation**




3. A block of Chewing gum



4. Current stage = Leftmost “Monolithic solid”

2. Advance to the next stage of the evolution trend

7. Selection of promising ideas and Building a new product concept

| 5 Ideas | 6 Customer Value |
|---|---|
| The second “Hollow structure” | |
| Hollow gum | Porous texture |
| Gum with jam | Enough jam taste |
| The third “Multiple hollows” | |
| Gum with empty bubble | Air texture |
| Gum with mint capsule | Stimulation taste lasts forever |
| The fifth “Porous with active elements” | |
| Gum with mint tube | The mint gushes whenever biting |

# 6. Summary of Beginner needs at Place of Practice（1）



## ① Tools suitable for Beginner Needs (the present stage)

This report — The size shows the frequency. of usage

### ＝ Three Beginner Needs ＝

＝ Two Aims ＝

| Needs / Aims | We want many ideas. ( divergence / idea ) | We want a definite solution. (concentration/logical) | We want a ground-breaking idea. ( deep thinking/ analysis/convergence ) |
|---|---|---|---|
| Out of the Restriction | Darrell Mann 31 Trends of Technological Evolution | Evolutionary Potential Radar Plot | Effects Database<br>Tree charts of Technological Evolution<br>Eight Patterns of Evolution<br>◆Personification Method<br>◆DE |
| Within the Restriction | 40 Inventive Principles<br>Darrell Mann Matrix 2003 versio | Technical Contradiction<br>Reverse TRIZ<br>76 Standard Solutions | ◆S-curve Analysis<br>◆Ideal Final Result<br>Physical Contradi -ction<br>Substance -Field Analysis<br>◆Multi-Screen<br>◆Problem Hierarchy Explorer<br>◆Resource Analysis<br>◆Device Analysis |

**These tools matched to the beginner needs are now used regularly, as the results of experiences of many practices.**

# 6. Summary of Beginner needs at Place of Practice（2）



## ② Summary of Beginner Needs

### ＝ Three Beginner Needs ＝

＝ Two Aims ＝

| Needs / Aims | We want many ideas. ( divergence / idea ) | We want a definite solution. (concentration/logical) | We want a ground-breaking idea. ( deep thinking/ analysis/convergence ) |
|---|---|---|---|
| Out of the Restriction 60% | The Ratio 50% | 30% | 20% |
| | Motivation | | |
| Within the Restriction 40% | Idea Generation Method<br>Results x Satisfaction | Expectation to TRIZ<br>Theory of TRIZ<br>Results x Satisfaction | New Viewpoints<br>Results x Satisfaction |
| | Necessary to well consider beginner needs | | Promoter's leadership is expected. |

# 7. Conclusion



1. “How to Lead Beginners to TRIZ ?” is a crucial issue of promoting TRIZ.

2. We often see discrepancy between beginner needs and selected tools/ approaches at place of practice.
   In-house promoters must be sensitive to beginner needs.

3. Beginner needs differs a lot.
   We should choose tools/approaches which match well to the specific beginner needs.

4. We should analyze various beginner needs and understand them well by using some categorization.
   In the present paper, we have classified them into 3 types of beginner needs times 2 types of aims, on the basis of our experiences of real practice.

5. We have suggested tools/approaches suitable for each category of the beginner needs. We wish they are helpful for your understanding of TRIZ.

— Two basic points we noticed through the analysis of beginner needs: —

◆ The success of the TRIZ practice depends not only the technical results but also the satisfaction of the engineers.

◆ In order to raise engineer’s satisfaction, coaching is more effective than consulting.

Thank you for your attention

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