The 9th Japan TRIZ Symposium 2013

Now, Once again 'There is no TRIZ that doesn't work'

– As a core technology for solution –

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株式会社IDEA

Innovative Development of Engineering as our Ark

CONTENTS

Introduction

TRIZ is a thinking process

The way of work
-is solved in a short course thoroughly and reasonably -

IDEA Inc. will support all of you
through a development technology centered on TRIZ
so that the Japanese manufacturers can
develop high-quality products fast and cheaply
to enable world-beating product making

(From our company profile)

Background

– In recent TRIZ symposia, methods of applying effective or simple TRIZ was proposed by precursory enterprises and study groups

– Since its company formation, IDEA Inc. has been supplying “Working TRIZ” in project consulting at a lot of enterprises

–This time, an overview analysis was performed based on the applications at enterprises where the author directly supported, and with this result, I will once again propose that “There is no TRIZ that doesn’t work” as the milestone of our company’s 10th anniversary

– The concrete products, themes and contents for discussion in each enterprise will be described in an abstracted and generalized form

'There is no TRIZ that doesn't work'?

- A topic presented at the IMC User Group Meeting in 2003 before the Japanese TRIZ Society was established

- Using TRIZ to create the best product in the world generating ideas inevitably, not accidentally

1. Produces an increased volume and higher quality
・Ideas are exhaustive and to the point
・A lot of ideas can be easily generated
・A lot of ideas can be shaped into the best concepts

2. Boosts motivation
・Strong points of one's own technology can be recognized
・Creative vision will be acquired
・The word "impossible" won't be easily used any more

使えないTRIZはない

株式会

September, 2003
Excerpt from
presentation slides

目次

2

5.TRIZを使いこなせないのは

問：どうしてでしょうか？

原因1.問題の分析と展開ができていない

どなどな展開ができていない

- 他責で考えている
- 専門技
- 問題を

原因2.アイデアの発散＆収束ができていない

アイデアの発想とコンセプト選択ができていない

- たくさん
- すぐに
- ｱｲﾃﾞｱ

6.どうすれば

問：良いアイデアがでるか？

対策1.問題の分析と展開ができること

どなどな展開ができている

- 自責で考えること
- 不足している専門技術が何であるかが解ること
- どなどな展開により根本原因が抽出できること

対策2.アイデアの発散＆収束ができること

アイデアの発想とコンセプト選択ができている

- たくさんのｱｲﾃﾞｱを出すこと
- すぐにｱｲﾃﾞｱを評価しないこと
- ｱｲﾃﾞｱの収束ができること

9

September, 2003
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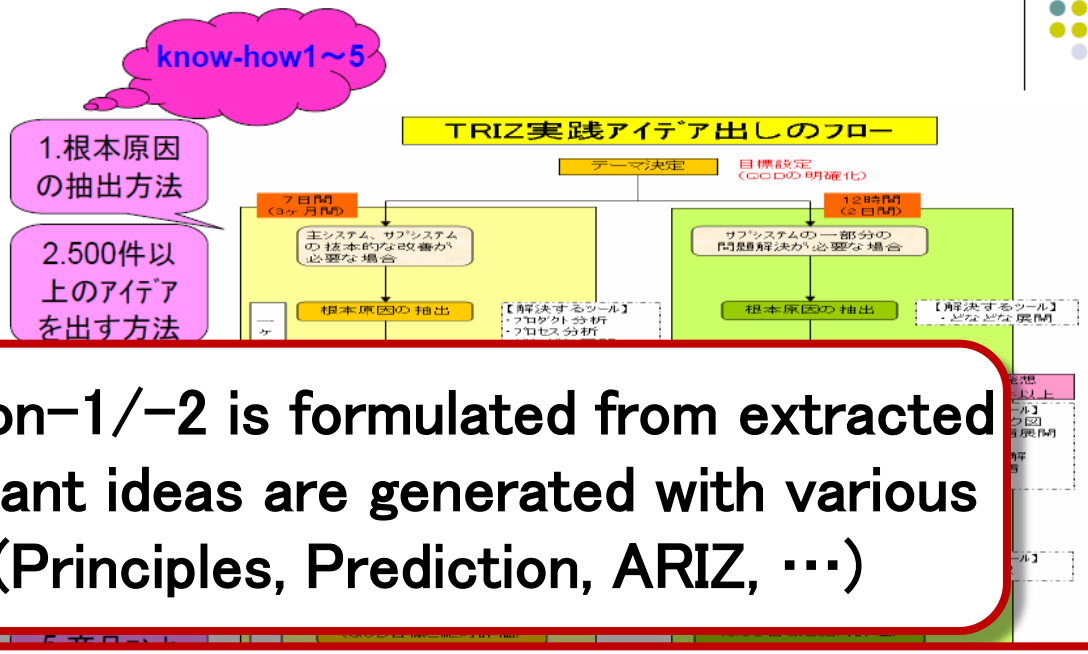
presentation slides

アイデア創出のknow-how

1. 根本原因の抽出方法
2. 500件以上のｱｲﾃﾞｱを出す方法
3. ｱｲﾃﾞｱの選択&結合方法
4. ｱｲﾃﾞｱを評価する方法
5. 商品ｺﾝｾﾌﾟﾄを創出する方

以上のKnow-howから
1.根本原因の抽出方法

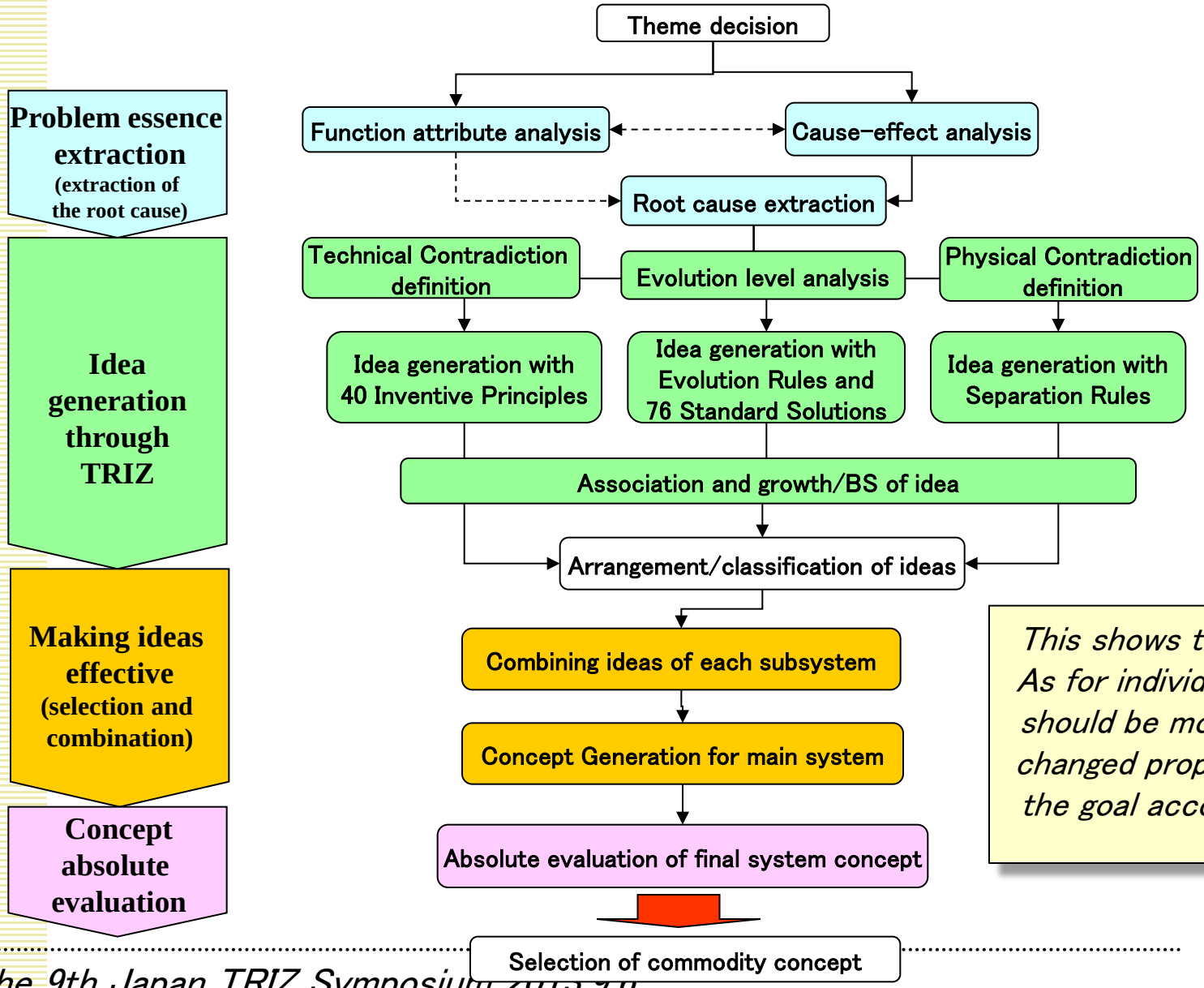
8.アイデア創出のフローとknow-how



Technical Contradiction-1/-2 is formulated from extracted root cause, and abundant ideas are generated with various problem solving tools (Principles, Prediction, ARIZ, ･･･)

Embarrassing problem is arranged as a contradiction, and then, TRIZ is applied

[Reference] Flow of basic project consulting



This shows the basic flow. As for individual themes, it should be modified and/or changed properly to aim at the goal accomplishment .

Problems regarding the Contradiction Matrix and Inventive Principles

- Formation of Technical Contradiction solution matrix
  - Altshuller investigated about 400,000 patent data all over the world during 1960–1970, from which he extracted about 40,000 innovative ones, which he investigated precisely and developed the matrix
  - The present matrix was completed in 1971 after several revisions
- Problems of Technical Contradiction solution matrix
  - It is considerably difficult and some experience is needed to abstract real problems as one of the 39 parameters which can be used in the Contradiction Matrix
  - And, even if one gets used to it, as it is not possible to deal with all the problems with this tool only, it is necessary to cooperate with other tools of TRIZ
  - Therefore, in order to use this effectively, it is desired to simplify the problem (e.g. clearly define the contradiction) at the former stage

*Reference: Theory Edition "Tools of Classical TRIZ" Nikkei Business Publication, Inc.

The Idea of "Solution"

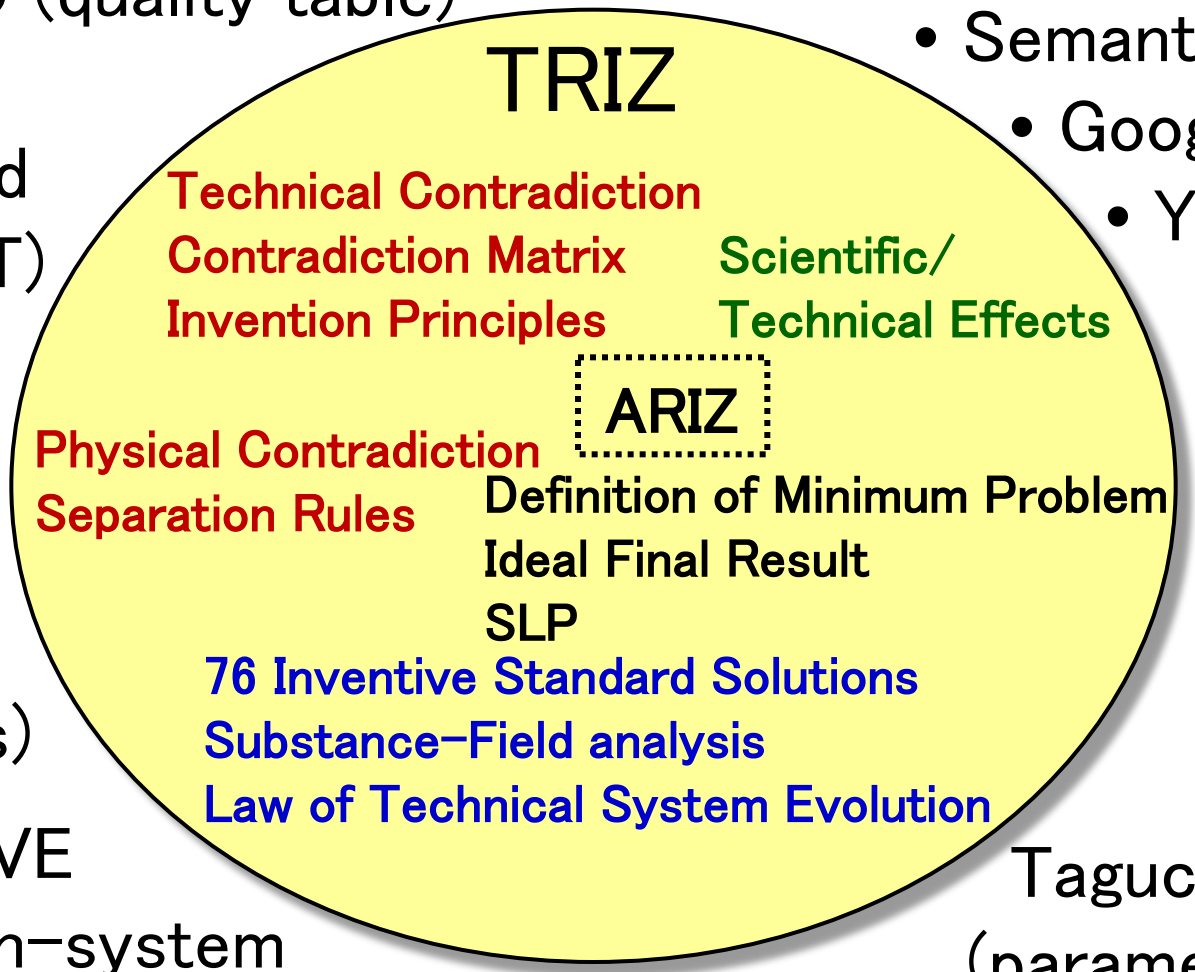
- In the beginning was the Problem
  - There are many kinds of problems which engineers grapple, including those about quality issues
  - Will TRIZ offer hints to solve the various kinds of problems? -> YES!
  - Is this possible by applying TRIZ only? -> YES & NO!
- The most suitable solution method for the problem should be applied
  - Select various tools which TRIZ possess
  - The optimum solution is efficiently reached combining related methods according to your purpose

QFD (quality table) – TRIZ | VE – TRIZ

KT method – TRIZ | QFD (quality table) – TRIZ – TM

TRIZ – TM | Concept Mining – TRIZ

TRIZ tools and related methods (example)



QFD (quality table)

Various search engines
- Semantic search
- Google
- Yahoo

etc.

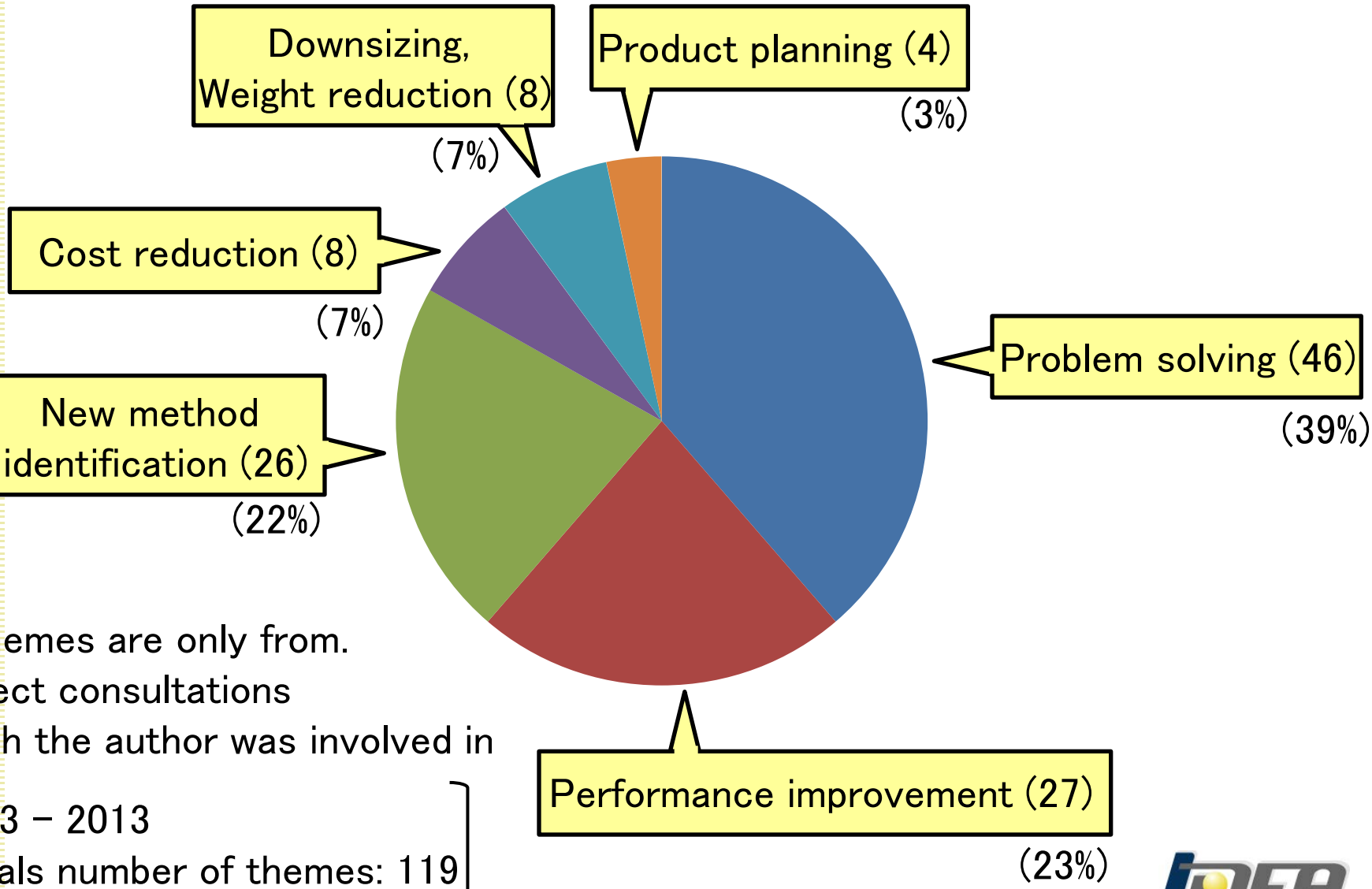
KT method
(IS/IS NOT)

TOC
(Theory of
Constraints)

VE
(function-system
diagram)

Taguchi method
(parameter design)

Analysis of TRIZ application themes (problems)



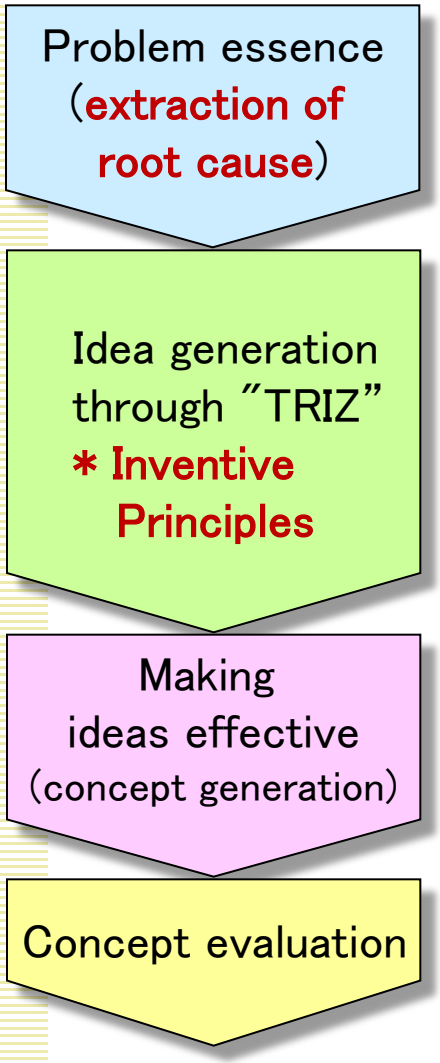
＊ Themes are only from.
project consultations
which the author was involved in

2003 – 2013
Totals number of themes: 119

Application to "Problem solving"

- What is "Problem solving"
  - In the product system, when harmful actions such as heat generation, noise, vibration, unnecessary radiation, or problems such as lack of product quality, damage, and the worsening feature to the improvement is clear
  - Often needs urgent countermeasures, and appears most frequently as a TRIZ application theme
- Application themes (example)
  - Vibration control at device drive, radiation sound decrease, prevention of heat generation
  - Decrease of unnecessary radiation of electric circuit
  - Trouble measures and yield improvement in the manufacturing process
  - Improvement of irregular screen brightness and image flickering
  - Trouble countermeasures for devices, parts, etc.

Application flow to "Problem solving"

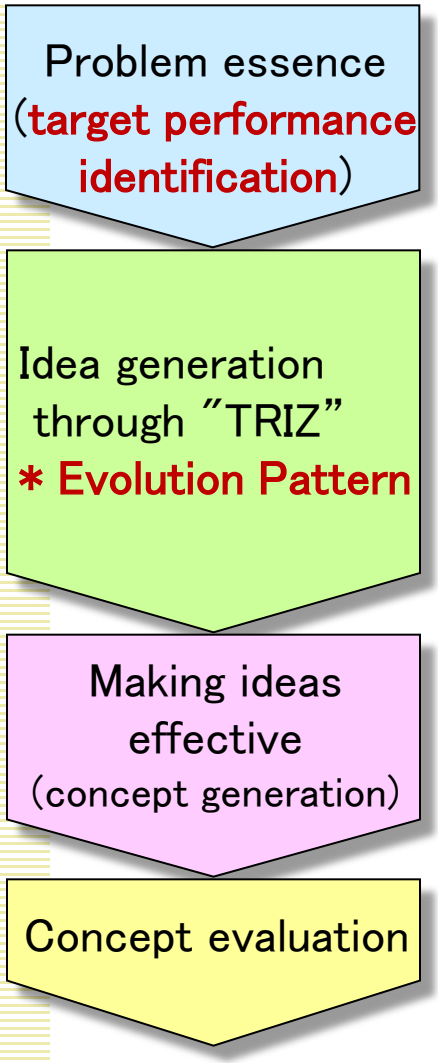


- 1. Confirm the theme
- 2. Structure the cause-effect model
- 3. Define Technical Contradictions using the root cause
- 4. Select Inventive Principles
- 5. Generate ideas
- 6. Arrange, classify and evaluate generated ideas
- 7. Combine ideas
- 8. Generate solution concepts
- 9. Evaluate concepts

Application to "Performance improvement"

- What is "Performance improvement"
  - Ability of basic function (performance) which the product system should provide
  - Processing speed or memory capacity of the personal computer, display resolution, etc., many of which have competitive relation in the market with competitors' products
- Application themes (example)
  - Image quality improvement of a diagnostic device
  - Clearness improvement of the photographic image
  - Speed-up of preprocessing in manufacturing process
  - Speed-up of chemical reaction
  - Improvement of radiator cooling capacity
  - Extending the life span of operation
  - Improvement of seat product delicacy
  - Improvement of impurity removal performance in liquid products

Application flow to "Performance improvement"

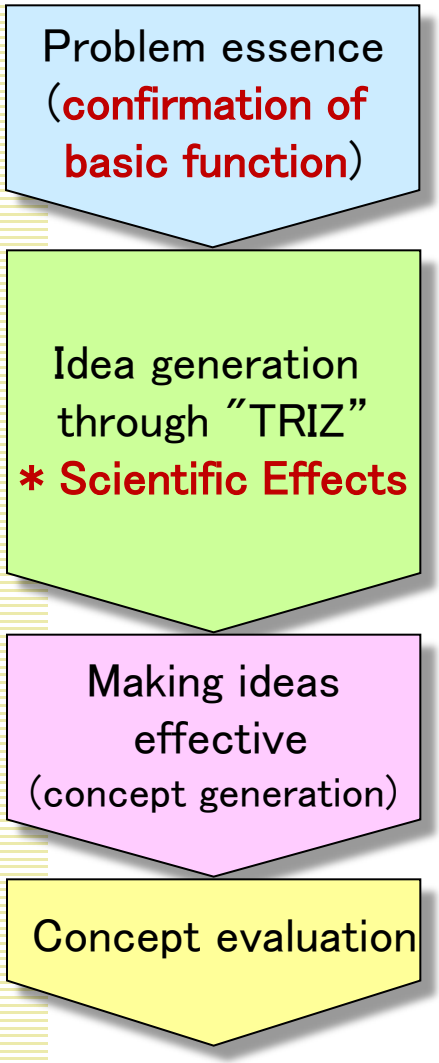


- 1. Confirm the theme
- 2. Clarify the performance to improve
- 3. Select the Evolution Pattern to use
- 4. Identify the present evolution level
- 5. Generate ideas
- 6. Arrange, classify and evaluate generated ideas
- 7. Combine ideas
- 8. Generate solution concepts
- 9. Evaluate concepts

Application to "New method identification"

- What is "New method identification"
  - Examination of a form or structure when traditional methods are assumed having reached critical limit or when another function wants to be added
  - As observed remarkably in the evolution process of the cellular phone or car navigation system, it often occurs when new features are taken in
  - Concept of "[6] Transition to the Super-system" in the Law of Technical System Evolution
- Application themes (example)
  - Examination of a new form for accuracy improvement
  - Examination of a new form for light condensation
  - A new manufacturing method of multilayer disk
  - Improvement of operability of a manual mechanism
  - Development of a grip method that doesn't cause internal stress
  - Identification of a new structure for shortening the lead time
  - Examination of a method for detecting the life span of a system

Application flow to “New method identification”

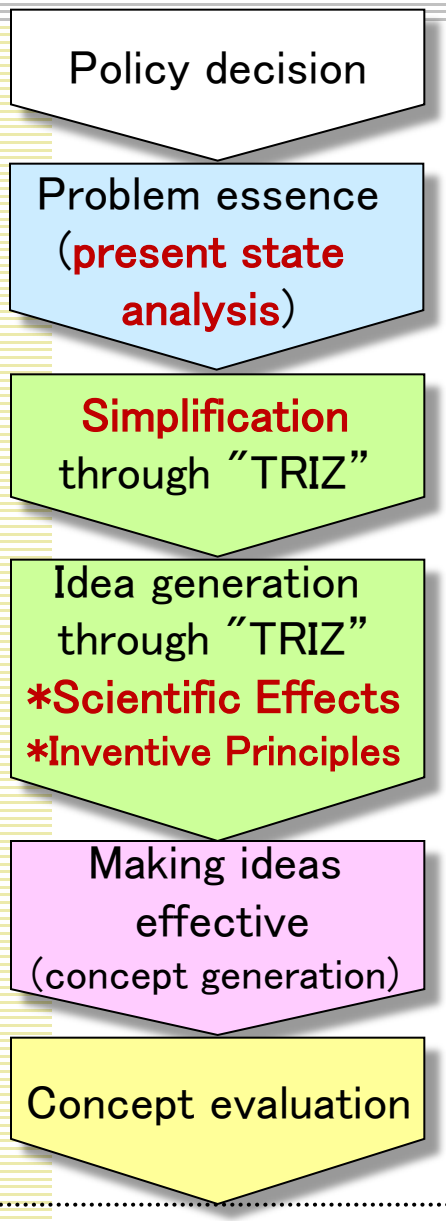


- 1. Confirm the theme
- 2. Structure the function model
- 3. Clarify the functions to achieve
- 4. Use the tool (Scientific Effects library) to investigate by function items
- 5. Generate ideas
- 6. Arrange, classify and evaluate generated ideas
- 7. Combine ideas
- 8. Generate solution concepts
- 9. Evaluate concepts

Application to “Cost reduction”

- What is “Cost reduction”
  - In order to secure profit even when facing decrease of the market price, cost reduction is a pressing issue
  - Cost reduction through VE is proceeding in a lot of enterprises, and when using TRIZ, high targets which are difficult to achieve through a usual approach is often set
- Application theme (example)
  - Examination of methods for cost reduction
  - Improvement of productivity for cost reduction
  - Shortening of lead time for cost reduction
  - Consideration of parts self-manufacture
  - Cost reduction of manufacturing device
  - Products cost reduction
  - Cost reduction of parts peculiar

Application flow to “Cost reduction”

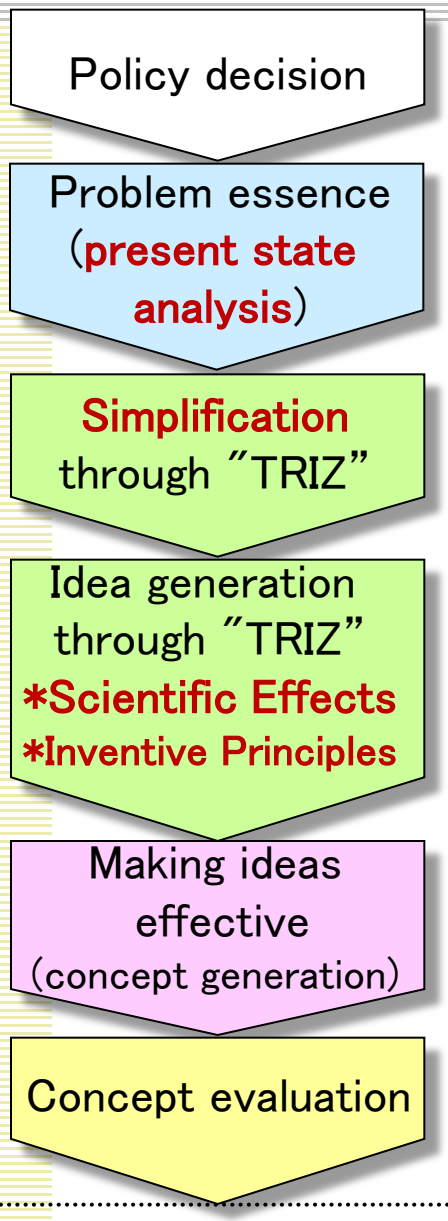


- 1. Set theme target (e.g. 50% decrease)
- 2. Structure the function model
- 3. Set cost information to components
- 4. Simplify through deletion/substitution of component/action
- 5. Generate ideas
- 6. Arrange, classify and evaluate generated ideas
- 7. Combine ideas
- 8. Generate solution concepts
- 9. Evaluate concepts

Application to “Downsizing, Weight reduction”

- What is “Downsizing, Weight reduction”
  - Downsizing and weight reduction is stressed also as a response to environmental issues besides the drive to “lighter, more compact,“ some time ago
  - Besides, it also relates to the law “[7] Transition from Macro to Micro” of the Technical System Evolution, and leads to the improvement of the function
  - The approach to the solution is similar to cost reduction
- Application theme (example)
  - Reduction in size and weight of product
  - Reduction in size of parts
  - Reduction in size and weight of operating portion
  - Reduction in size and weight of production equipment
  - Decrease in product earth floorage
  - Making the drive assisting part smaller and thinner

Application flow to “Downsizing, Weight reduction”



- 1. Set theme target (e.g. 50% decrease in capacity and weight)
- 2. Structure the function model
- 3. Simplify through deletion/substitution /absorption of component/action
- 4. Generate ideas
- 5. Arrange, classify and evaluate generated ideas
- 6. Combine ideas
- 7. Generate solution concepts
- 8. Evaluate concepts

Application to "Product planning"

- What is "Product planning"
  - Discovering the user needs, designing and determining suitable product concepts, and bridging them to commercialization of products
  - The usage of the target user should be concretely imagined, and potential customer needs should be probed for in order to embed features that would exceed the competitors
  - The key success factor will be the extraction of the "Attractive quality" in Kano's Dual Quality Model
- Application theme (example)

  - Search for product images in the future (** years after)
  - New value creation of product systems
  - Usage search for elemental technology

Application flow to "Product planning" (1)

Policy decision

Product planning examination
*quality table

Identify and analyze commodity concept problems

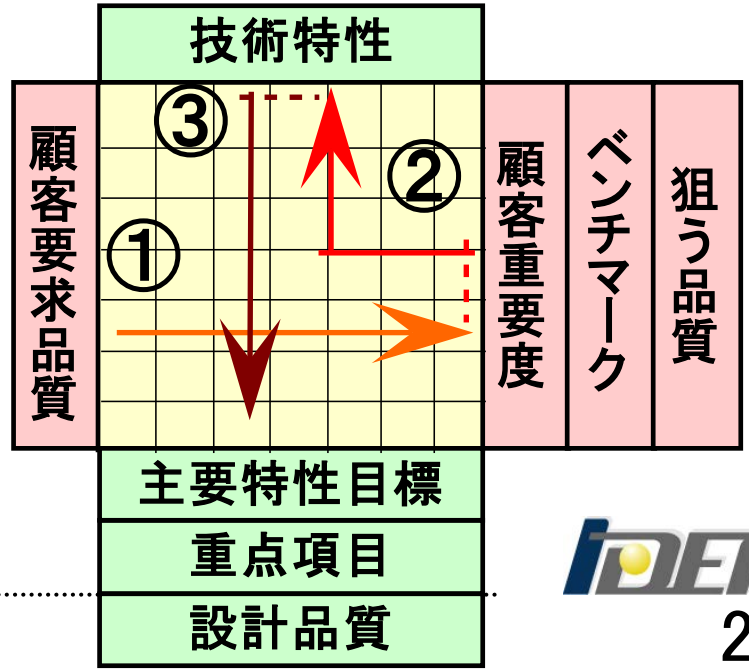
Idea generation through "TRIZ"
*Inventive Principles
*Evolution Patterns
*Scientific Effects

Making ideas effective

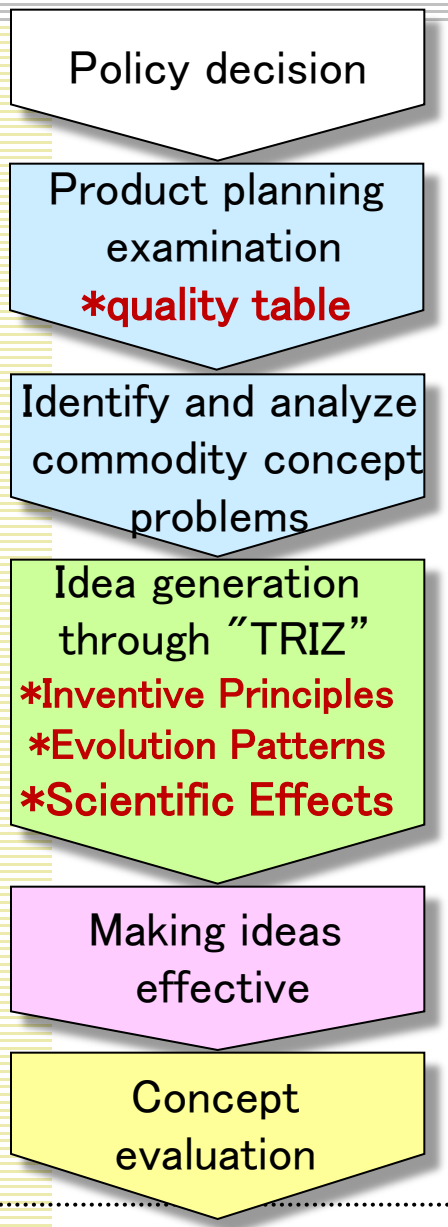
Concept evaluation

- 1. Set the theme (e.g. Product planning of the next generation ** machine)
- 2. Analyze customer needs and wants of the existing commodity
  → Set commodity concepts
- 3. Identify technical problems for realizing the commodity concepts

＊ QFD
(quality table)

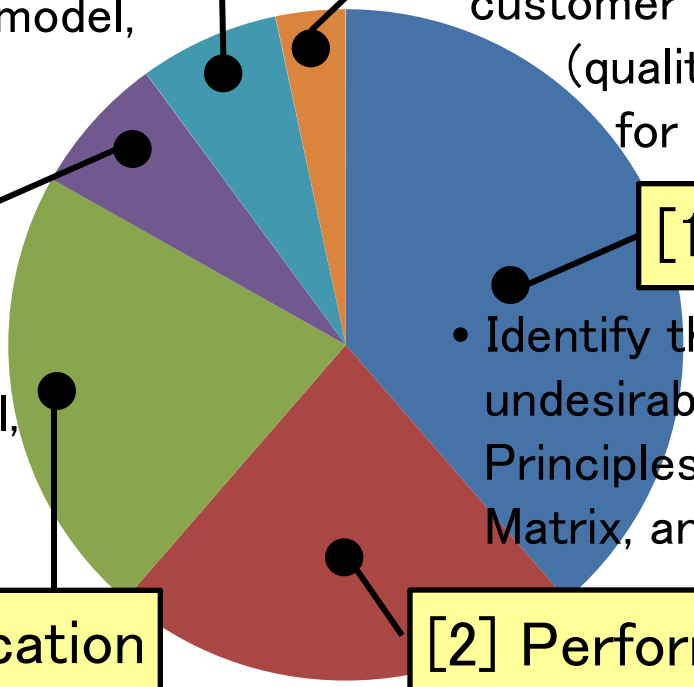


Application flow to "Product planning" (2)



- 1. Set the theme (e.g. Product planning of the next generation ** machine)
- 2. Analyze customer needs and wants of the existing commodity
  → Set commodity concepts
- 3. Identify technical problems for realizing the commodity concepts
- 4. Generate ideas
- 5. Arrange, classify and evaluate generated ideas
- 6. Combine ideas
- 7. Generate solution concepts
- 8. Evaluate concepts

Application flow summary (up to idea generation)



[5] Downsizing, Weight reduction

- Determine the target value, structure the function model, generate ideas for system simplification

[6] Product planning

- Set commodity concept analyzing customer demands using QFD (quality table), generate ideas for technical problem solving

[4] Cost reduction

- Determine the target value, structure the function model, set costs to components, and simplify the system

[1] Problem solving

- Identify the root cause of the undesirable event, select Inventive Principles from the Contradiction Matrix, and generate ideas

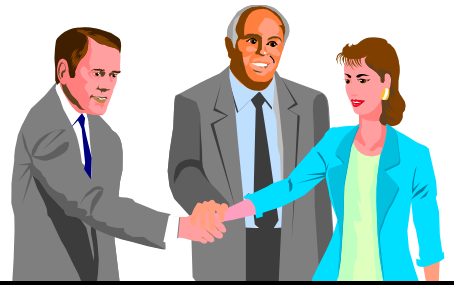
[3] New method identification

- Clarify the function to be achieved on the function model, examine new method ideas from Scientific Effects via the function item

[2] Performance improvement

- Clarify the performance to improve, select the Evolution Pattern to use, generate ideas based on the present evolution level

Summary TRIZ as the "Core method for solution"



Customer needs

Sets development targets by deploying customer's voice to product functions

Secures high quality by optimum design controlling variations

Taguchi Method

QFD (quality table)

TRIZ

Solves technical problems

Idea generation – concept generation

Cost reduction

Problem solving

Reduction in size and weight

Performance improvement

Product planning

New method identification

TRIZで日本の製造業を支援する

Innovative Development of Engineering as our Ark

Thank you for your attention!