The Sixth Japan TRIZ Symposium 2010

TRIZ for Managers

- Approach and Management using a Scientific Methods -

Scientific methods (QFD, TRIZ, Taguchi method, etc.) are tools for gaining, operation itself and management itself!

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MOST, LLC

President Kazuya Yamaguchi

Translated by Yoshihisa Konishi

Company Profile

About MOST, LLC

A group where retired employees of Panasonic and Panasonic Communications Co., Ltd., who had mastered scientific methods (general-purpose techniques such as QFD, TRIZ, Taguchi method, multivariate analysis, sales analysis, etc.) and were active at the company-wide work restructuring, have gathered together.

The name MOST was denominated with the following meaning:

You can get the MOST performance
by MOST (Management Of Scientific Tool)
with MOST (MOST, LLC) .

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Biography of Kazuya Yamaguchi, President of MOST, LLC

1970.3 Graduated Communication Engineering Dept.,

School of Engineering, Kyushu University

1970.4 Joined Kyushu Matsushita Electric Industrial Co., Ltd

- engaged in product development

  served as technical section chief and manager

- engaged in company-wide work reconstruction

  Kyushu Matsushita Electric Industrial Co., Ltd

  General Manager, Development Process Innovation Department

  Panasonic Communications Co., Ltd.

  Deputy General Manager, Management Quality Promotion Department

  (Japan Quality Award, development process innovation, quality innovation, back-office section innovation, factory innovation), (2007.8.31 age-limit retirement)

Currently President of MOST, LLC (Established 2007. 9. 3)

Part time lecturer at Ritsumeikan University Postgraduate school (Quality Management)

Part time lecturer at Yamaguchi University (Leading edge in Development Process)

Part time lecturer at Kyusyu University (Management Quality Innovation)

Lecture Contents

I. The figure which a company activity aims at

1) The present conditions in development of products and things, and the direction that we should aim at
2) Relation between JQA(Japan Quality Award) thought and application of scientific technique

II. Trans-Disciplinary Fundamental Technologies

1) What is needed to accomplish the mission of company activity
2) What is QFD(Quality Function Deployment)!
3) What is TRIZ!
4) What is Quality Engineering (Taguchi Method)!

III. Summary

1) Creative problem solving process and scientific methods
2) Difference between scientific method utilization and common management!
3) What is TRIZ for managers!

I. The figure which a company activity aims at

1) The present conditions in development of products and things, and the direction that we should aim at

2) Relation between JQA(Japan Quality Award) thought and application of scientific technique

1-1) The present conditions in development of products and things

Inefficient activity of own way

No management
Nonscientific contempt

A way of thinking to assume that we are good at the level that we had (plan, quality, cost, delivery date, function)

Waste of money,
Waste of time,
Lose competitive advantage

We lose the trust of customers
Tough management situation

1-2) Direction that we should aim at "Approach and Management"

With rational scientific technical method

With future prediction and development of products

Good, early and cheaply

We have to realize necessarily, logically and scientifically

Products which are superior to other companies
Products development of good cost performance
Lighter, more compact facilities
1/10 facility development

We need a **management** who can say this

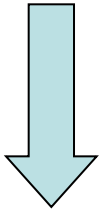
How will QCD be improved when we use scientific technical methods?

Conventional development technique management

1. Left to individuals
2. Management is difficult
3. Without using the brain

We think to have fully drawn abilities of engineers

We can show only power of 30%



• Scientific technical method utilizing management

1. Tool is good
2. Technical argument
3. Argument by many

We can show power of 130%

We can draw abilities of engineers to the maximum

Increasing sales and profit by strengthening product competitiveness

Management means to draw abilities of engineers to the maximum

Assessment standard of JQA(Japan Quality Award)

JQA

1. Direction to aim at

POV: Customer/Competition/Reform

Result: Excellent achievement

MB Award in US President Regan

2. Basic idea (The common sense of values that an organization should have)

1) Basic thought (4 elements)

Create and provide customer value

(1) A customer-oriented way of thinking

The formation and display of the so far few "original ability" that the other organization does not have

(2) Original ability

(3) Employee serious consideration

(4) Harmony with society

Contribution to society
Harmony with social value

Provide places and environment for employees to exercise their autonomy and creativity

2) Decision-making by value premise

Value premise management from "ideal world" and "desirability"

Disapprove of fact premise management

Scientific method

Explore the ideal world to a great deal

We will utilize QFD and clarify an aim

Realizable with QFD, TRIZ and Taguchi method

Managers have to regard these methods as management tools

Thought is same as TRIZ and Taguchi method

II. Trans-Disciplinary Fundamental Technologies

"thinking from the standpoint of a manager"

1. **Necessity to fulfill mission of company activity**
2. **What is QFD(Quality Function Deployment)!**
3. **What is TRIZ!**
4. **What is Taguchi Method!**

1. What are company activities and manager's tasks
Steps for product creation at companies

Product creation = Requested quality elaborating activity = Intellectual creation activity

1. Marketing **Product plan**	**Surveying the market and decide what kind of product to make**
2. Research and Development	**In what parts structure to create the product**
3. Product development and design	**In what specification to create the product**
4. Fabricating method development **Factory**	**In what facility / condition to create the product**
5. Sales (Market) **Service**	**Are the customers satisfied?**

Producing excellent achievements and results …
responsibility of the manager also

1-2) What to study! What to make study!
Essentials for products/things creation

Traditional approach

1. **Expertise and traditional quality control techniques only**

ceramic technology, electronics, information engineering, communication engineering, mechanical engineering, applied chemistry, physics, aeronautical engineering, electric engineering, etc.

7 tools for QC, TQM, FMEA, FTA, etc.

All-purpose technologies where momentum gathered for activities after 1990

Supports intellectual creativity and problem solving is easily achievable

To be Added to the traditional:

2. Development process technology

Managers need paradigm shifts to management

The most important processes are QFD, TRIZ and Taguchi method (world's highest all-purpose technologies)

Besides, combined use of IT, etc. is also required

1-3) Product creation oriented

Company activity (production cycle) and Development process technology

Company activity (production cycle)	Effective Development process technology
Marketing	….. QFD
R & D	….. QFD, TRIZ
Product development	….. TRIZ, Taguchi Method
Fabricating method development	….. TRIZ, Taguchi Method
Production	….. Taguchi Method
Verification	….. Taguchi Method
Sales	….. QFD
After-the-sales service	….. QFD

Quality Engineering = Taguchi Method
in Japan oversees

II. Trans-Disciplinary Fundamental Technologies

1. Necessity to fulfill mission of company activity
2. **What is QFD(Quality Function Deployment)!**
3. What is TRIZ!
4. What is Taguchi Method!

2-1) What is QFD?

(Quality Function Deployment)

The task of business management or manager begins with accurately understanding the customer's request

Method to accurately understand the customer's request

The best way to create salable products
at various discussions including Product planning stage reflecting matters (quality) requested by customers in product creation

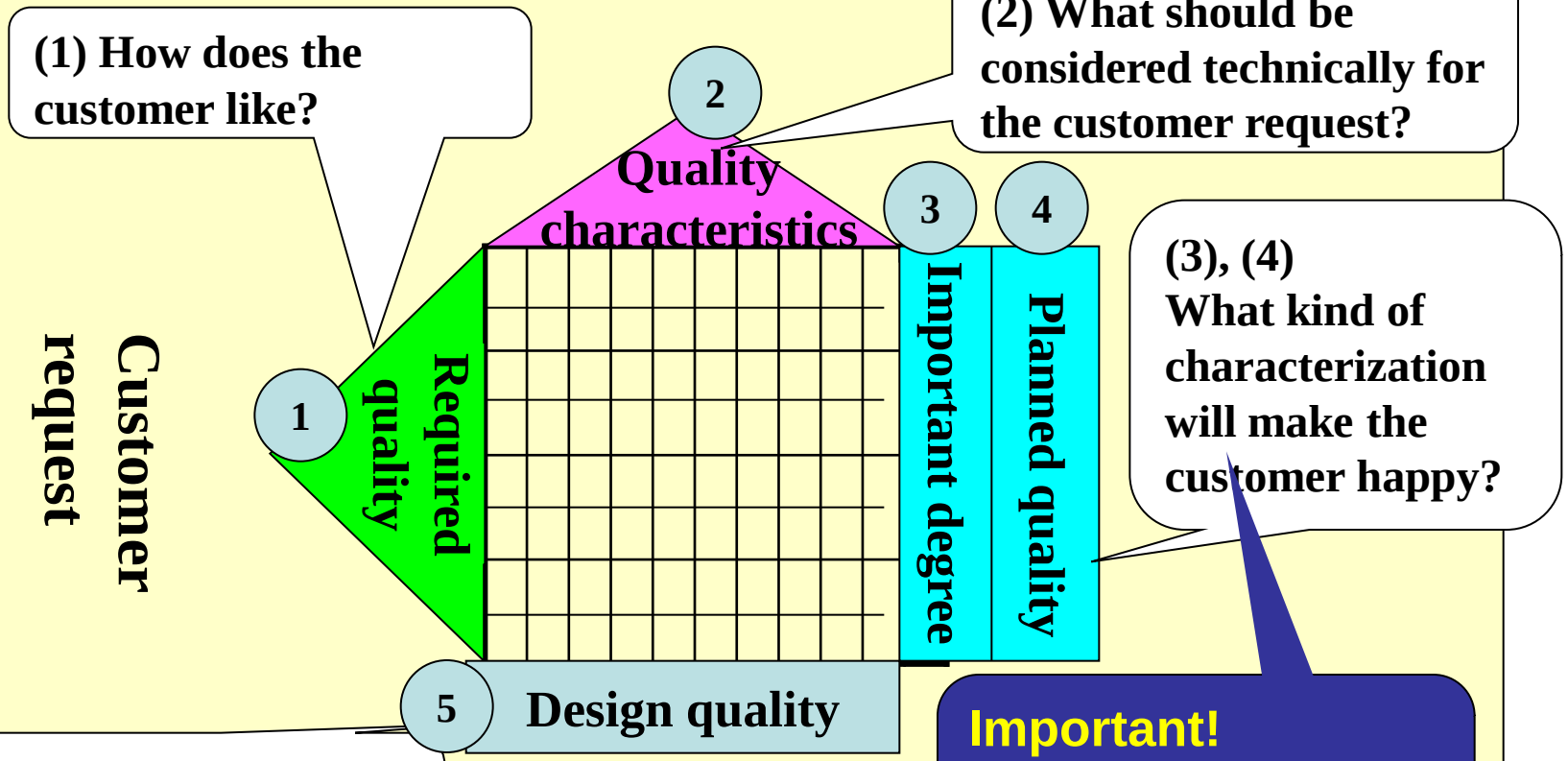
Goal clarification
Task clarification
Action item clarification

You may probably think that such things are naturally performed …
… but, actually, they aren't performed in most cases

2-2) What is QFD?

(Quality Function Deployment)

A very simple binary sheet



What is QFD? (Summary)

- **A method for clarifying what technical realization would ensure the qualities that the customers request and make them happy complying with their requests**
- **A method that clarifies the design quality (objective) thereafter**

Feature
Enables investigation without leaks

The best way to create salable products reflecting the matters (quality) requested by customers in product creation at various considerations including the product planning stage

First, there is QFD in any operation (including R&D)

Concrete grounds for realization of technical problems is in TRIZ!

II. Trans-Disciplinary Fundamental Technologies

1. Necessity to fulfill mission of company activity
2. What is QFD(Quality Function Deployment)!
3. **What is TRIZ!**
4. What is Taguchi Method!

3-1) A method that supports thinking to enable easy creation of only-one number-one products

What is TRIZ?

TRIZ / TIPS: (Russian) Теория Решения Изобретательских Задач

(English) Theory of Inventive Problem Solving

Enables structure determination of a perfect system that is good in QCD

The basic of R&D

3-2) What is TRIZ?

• A tool that supports to easily generate all the ideas for solving difficult technical problems by thinking based on the human thought pattern at the research / development / design stages

A tool that supports **creativity**

1) Investigated and analyzed 2.5M past patents,

• Patents are the thinking agglomerate of resourceful persons of all mankind

2) Systemized patents, and

• Easily to utilize

• Gives hints
• Enables logical thinking

3) Created a tool that supports solving difficult technical problems

3-3) How is TRIZ thought pattern!

2.5M patent analysis systematized cases

Hints available 99%

TRIZ standardizes on essential analogies using excellent problem solving case of the past in other fields as hints even for things that seem to be the first case in one's field, etc. and at the same time on pursuing to make the maximum use of ideality and resources

(1) Is the current technical problem an unprecedented attempt for mankind?

Should be NO

(2) Don't you think that there is a solution case of the past in another field that would give you a hint?

Should be YES

(3) Are the existing resources utilized ideally?

Should be NO

3-4) TRIZ is amazing. Why?

A way of conventional work

- **Nonscientific contempt**
- **Inefficient activity of own way**
- **Whack-a-mole R&D activities after one's own style**
- **Solutions within the range which one can think of or recognize**

TRIZ

This is the ultimate level of knowledge management

1. There are all thought patterns of the human in 2,500,000 patents

Person acquiring USA patents is world top-level human being

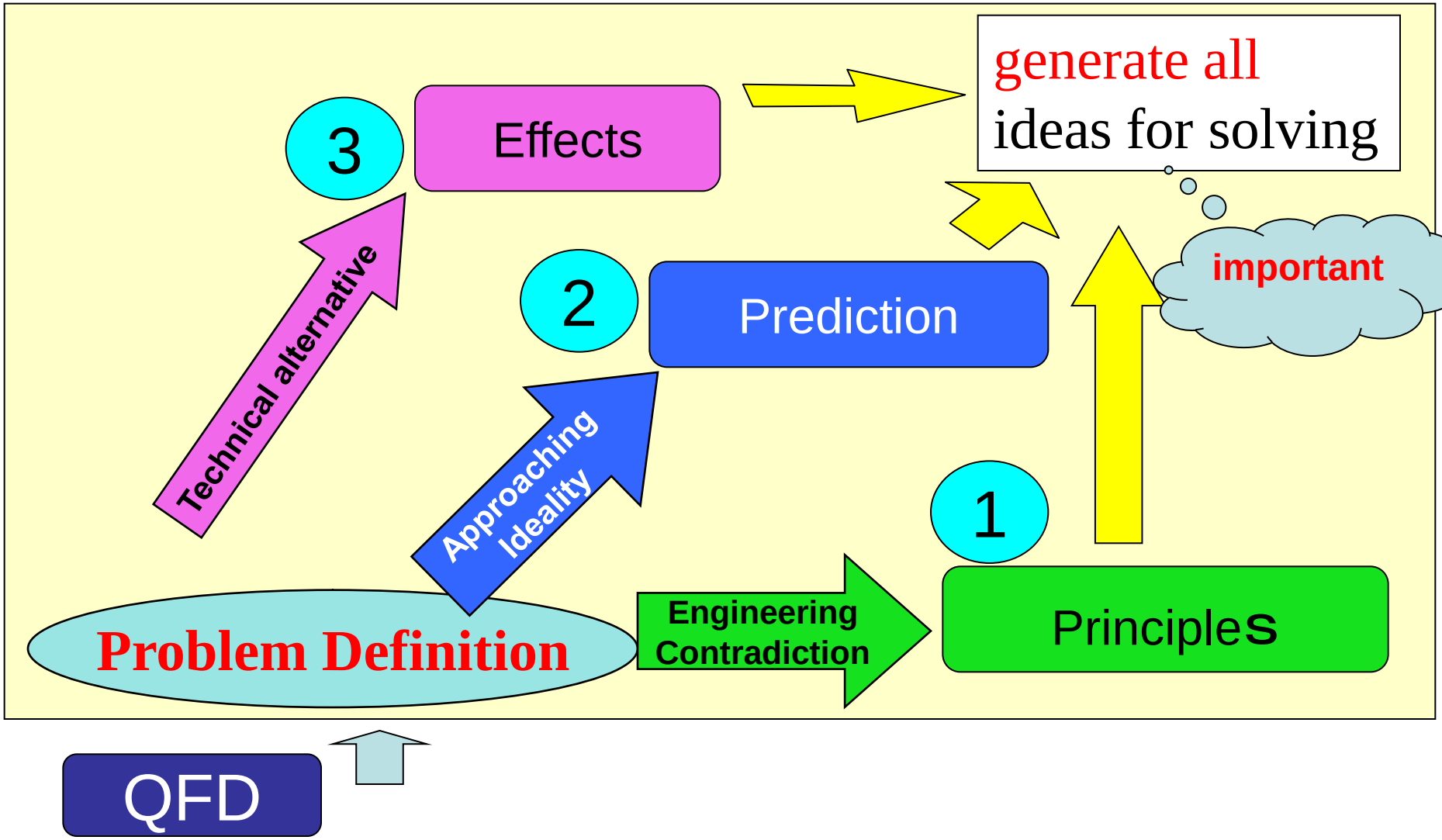
2. It is arranged well

Principles, Effects, Prediction

3. Thought aiming at is good

The philosophies of "pursuit of ideality", "maximum use of resources" and "contradiction resolution" are explored to a great deal

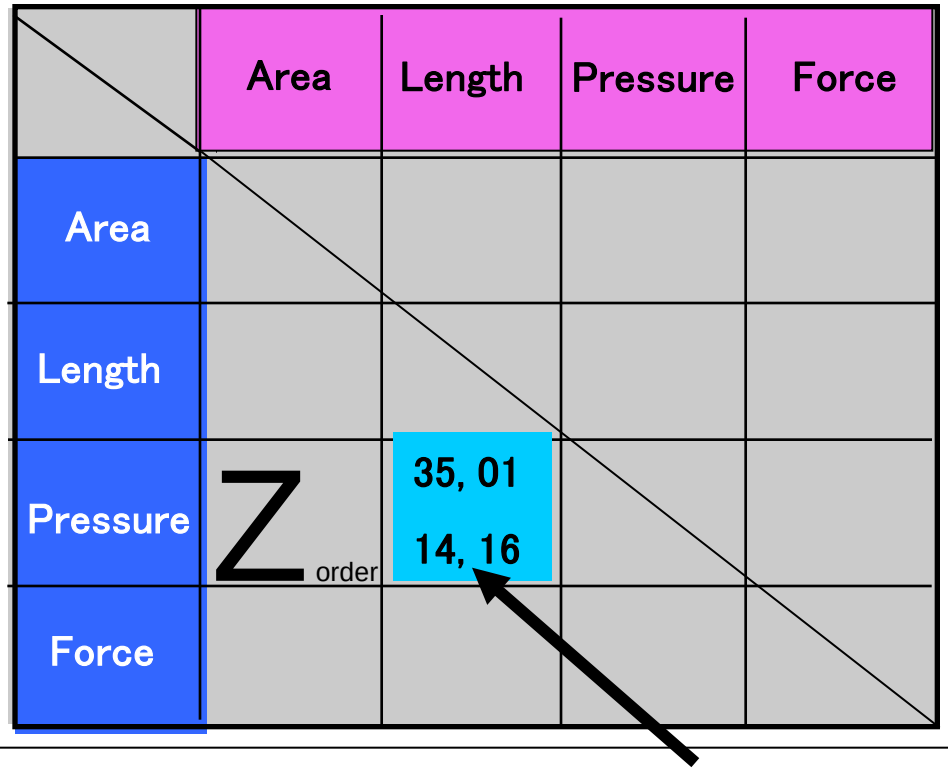
3-5) TRIZ structure (3 main pillars)



1 Engineering Contradiction Solving Matrix

39 Worsening Parameters

39 Improving Parameters



Up to 4 Inventive Principle numbers used to solve engineering contradictions are listed according to how frequently they were used in the 2.5M patents

39 Engineering Contradiction Parameters

The same parameters are on the vertical and horizontal axes

1. Weight of moving object
2. Weight of stationary object
3. Length of moving object
4. Length of stationary object
5. Area of moving object
6. Area of stationary object
7. Volume of moving object
8. Volume of stationary object
9. Speed
10. Force (Intensity)
11. Stress or pressure
12. Shape
13. Stability of the object's composition
14. Strength
15. Duration of action of moving object
16. Duration of action by stationary object
17. Temperature
18. Illumination intensity
19. Use of energy by moving object
20. Use of energy by stationary object
21. Power
22. Loss of Energy
23. Loss of substance
24. Loss of Information
25. Loss of Time
26. Quantity of substance
27. Reliability
28. Measurement accuracy
29. Manufacturing precision
30. Object-affected harmful factors
31. Object-generated harmful factors
32. Ease of manufacture
33. Ease of operation
34. Ease of repair
35. Adaptability or versatility
36. Device complexity
37. Difficulty of detecting and measuring
38. Extent of automation
39. Productivity

Parameters are described in very versatile terms

List of 40 Inventive Principles

Principles numbers are listed at the intersection of the matrix

Principle numbers obtained from the Length vs. Pressure contradiction

35, 01

14, 16

1. Segmentation
2. Extraction
3. Local Quality
4. Asymmetry
5. Consolidation
6. Universality
7. Nesting
8. Counterweight
9. Prior Counteraction
10. Prior Action
11. Cushion in Advance
12. Equipotentiality
13. Do it in Reverse
14. Spheroidality
15. Dynamics
16. Partial or Excessive Action
17. Transition into a New Dimension
18. Mechanical Vibration
19. Periodic Action
20. Continuity of Useful Action
21. Rushing Through
22. Convert Harm into Benefit
23. Feedback
24. Mediator
25. Self-service
26. Copying
27. Dispose
28. Replacement of Mechanical System
29. Pneumatic or Hydraulic
30. Flexible Membranes or Thin Films
31. Porous Material
32. Changing the Color
33. Homogeneity
34. Rejecting and Regenerating Parts
35. Transformation of Properties
36. Phase Transition
37. Thermal Expansion
38. Accelerated Oxidation
39. Inert Environment
40. Composite Materials

2 Prediction
(Law of Technical Evolution and Standard Solutions)

There are laws in

- **Technical evolution**

and

- **Problem solving**

- Law of technical evolution and
- Standard solutions

Overview of "Standard Solutions" in TRIZ

Total 127 items

A. Completing incomplete "Substance-Fields" — 1 item

B. Detection and measurement problems — 12 items

C. Eliminating harmful effects — 37 items

1) Modification of an existing substance	(4 items)
2) Modification of field	(5 items)
3) Introduction of a new substance	(11 items)
4) Introduction of a new field	(5 items)
5) Introduction of a new substance and field	(3 items)
6) Transition to a subsystem	(3 items)
7) Transition to a super-system	(6 items)

D. Improving insufficient or excess interactions — 65 items

1) Modification of an existing substance	(18 items)
2) Modification of field	(7 items)
3) Introduction of a new substance	(15 items)
4)) Introduction of a new field	(4 items)
5) Introduction of a new substance and field	(12 items)
6) Transition to a subsystem	(3 items)
7) Transition to a super-system	(6 items)

Field types … mechanical, optical, thermal, chemical, etc.
13 main types

3 Effects

(Source: TechOptimizer)

Engineering database of 5,888 scientific effects and applications

37 items to detect electromagnetic waves or lights:

- Monitoring X-ray beam alignment
- Screen for visualization of X-ray images
- X-ray imaging array
- Electret dosimeter
- Optical information recording disc
- Barkhausen effect
- Photochromic effect (influence of intensity)
- Optical memory based on photochromic materials
- Holographic system
- Hologram recording material
- Roentgenoluminescence
- Principal axes determination in anisotropic crystal
- Fixing moving image frame
- Producing image on liquid crystal display
- Visualization of stress pattern
- Resonant photodiffractive effect

21 other items

3-6) Feature of ideas by TRIZ utilization

Consideration from all angles along TRIZ thought pattern (Idea generation)

Image of idea consideration

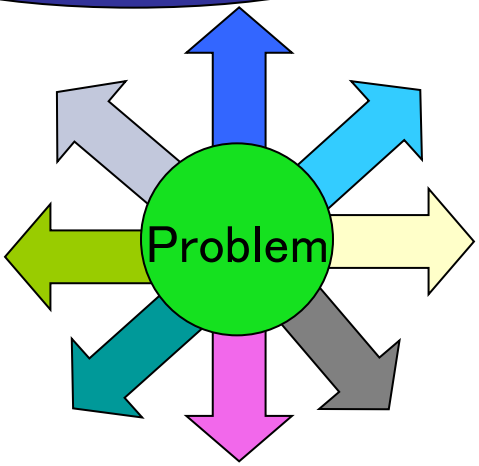
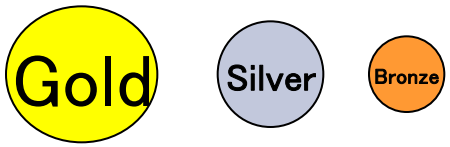


Image of classification



Idea spread

through consideration in all directions

- **without overlooking and being right on target**
- **ten to twenty times more ideas compared to conventional ratio**

Idea convergence

- **Putting together as the best concept**

  utilizing all the enormous ideas

  considering the QCD quality and possibility

3-7) Extract of TRIZ

1. Underlying thought of TRIZ (Goal)

We can image the "ideal solution"

- Thorough pursuit of ideal and evolution of system
- Maximum use of free resources
- Minimum introduction of paid resources

Result: Seeking an ideal solution,

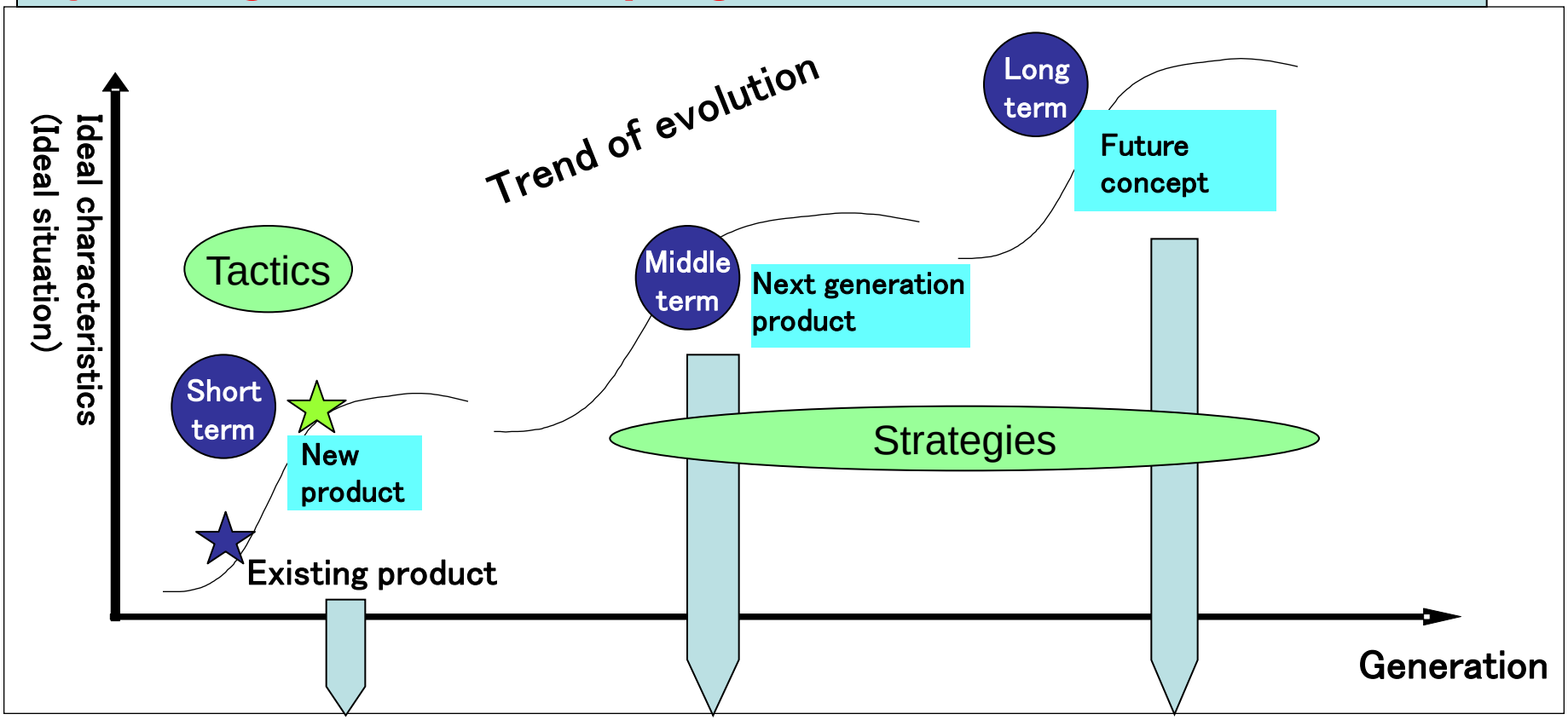
the quality also improves naturally

… same as with Taguchi method

2. Full with hints for solving to ideal solution

3-8) Utilize TRIZ, and develop tactics/strategies for short to long term

Even strategies can be developed by idea generation keeping the ideal solution in mind



Advance patent application

3-9) TRIZ (Summary)

Management

- Management that supports thinking to enable easy creation of only-one number-one products
- Supreme knowledge management

Tool

A tool that supports to easily generate all the ideas for solving difficult technical problems by thinking based on the human thought pattern at the research / development / design stages

Product

Within crushingly short time,
enables concept (system structure) of a perfect product that

- excels in ideality and goes ahead of the times

→ Taguchi method

3-10) How to use TRIZ actually?

1. Define voice of customer and the goal we want to create

Product plan … what should be possible technically?

Research and development … what should be possible technically?

Clarification of goals (The higher the goal, the better)

Product concept (Goal)

… QFD

2. Research and Development …

What kind of thing can be technically done?

Design … We want to largely lower component cost

- Embodiment on the desk (brain only)
- Foresee the future (from tactics to strategies)

TRIZ

Concrete product concept

Schema clarification on the desk (with the brain only)

(Product creation that makes positive impression on customers)

Enables structure determination of a perfect system that is good in QCD

Taguchi method

Products creation tolerant of error conditions

II. Trans-Disciplinary Fundamental Technologies

1. Necessity to fulfill mission of company activity
2. What is QFD(Quality Function Deployment)!
3. What is TRIZ!

4. What is Taguchi Method!

1) What is Taguchi Method?
2) Basics of Taguchi method
3) Summary of Taguchi method
4) Application to software
5) Taguchi method case (31-legged race)
6) Approach and management for people who don’t know Taguchi method

1-1) What is Taguchi method?

• TRIZ can be strongly promoted because there is Taguchi method
• Taguchi method is vital for strongly promoting TRIZ

• **The world's best comfort technical method to secure quality in research / development / design stage**

1. The founder Dr. Genichi Taguchi (1924-)

2. Action start from about 1950

3. 1960 Received Deming Prize

He is called the man who revivified the U.S.A.

4. In the middle of 1980's, he applied Taguchi method to stagnant American auto industry and brought it back

Demonstrated that Taguchi method is practical

6. 1988 Inducted into United States Hall of Fame of International Science & Technology (Da Vinci, Newton the sixth living person)

7. 1993 "The Taguchi Method Forum" established in Japan (Changed to Quality Engineering Society)

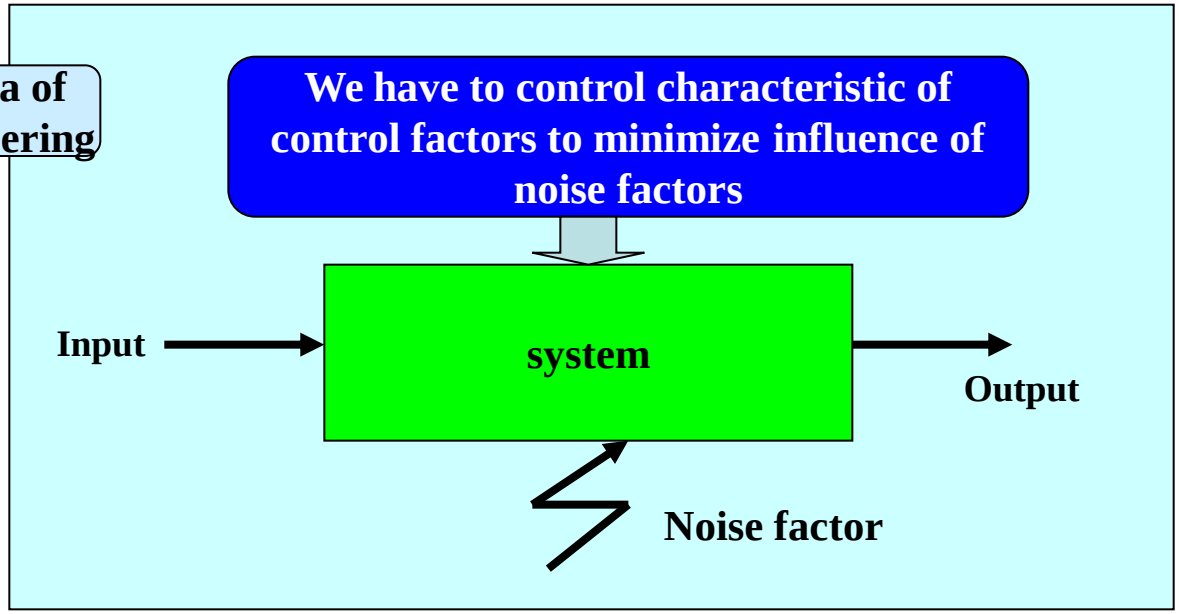
8. 1994 Inducted into United States Hall of Automation
(Soichiro Honda, Eiji Toyoda, Genichi Taguchi, Yutaka Katayama, Jiro Yanase, Shoichiro Toyoda)

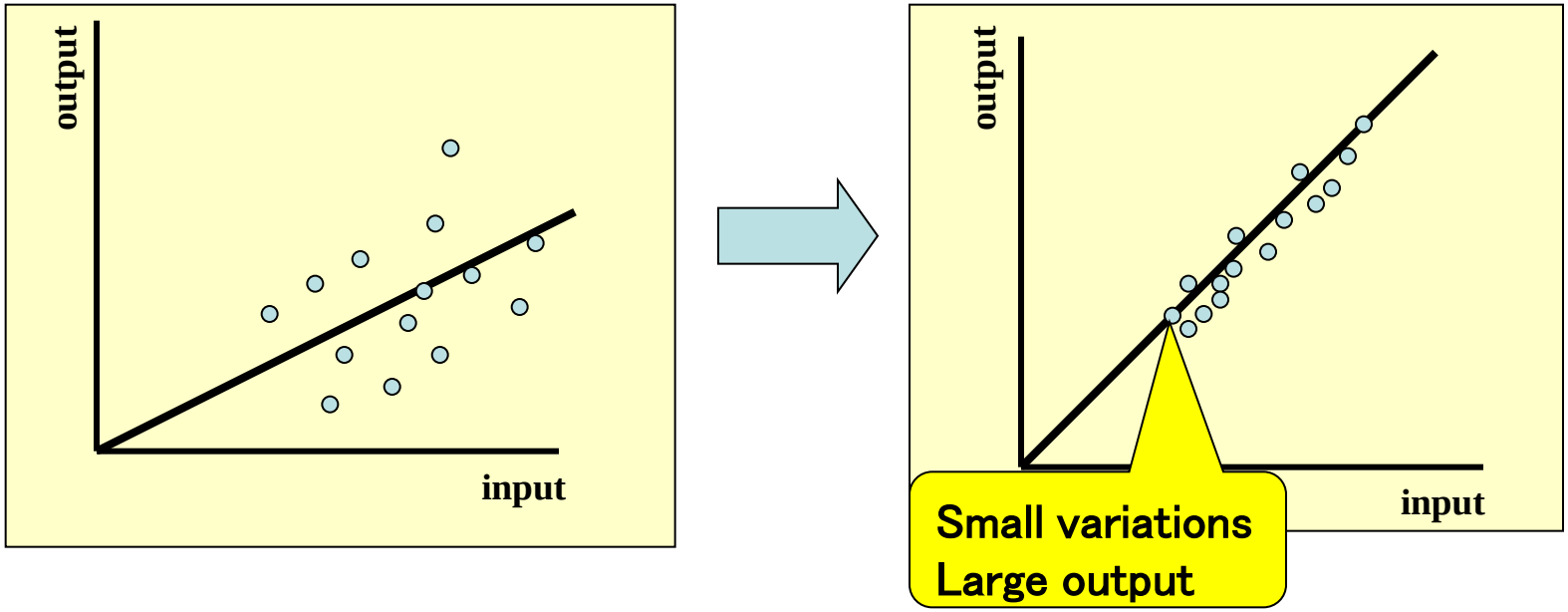
9. 1997 Dr. Taguchi entered American car palace (The third Japanese. Six present)

2) Basics of Taguchi method (1)

A general idea of control engineering

We have to control characteristic of control factors to minimize influence of noise factors





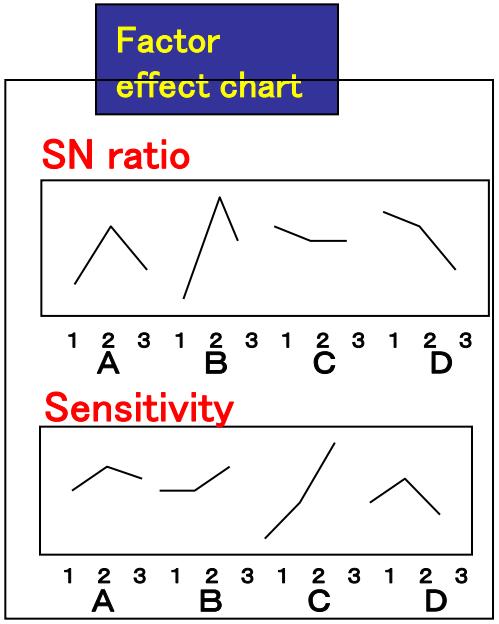
2) Basics of Taguchi method (2)

Orthogonal experiment

	control factor			
	A	B	C	D
1	1	1	1	1
2	1	2	2	2
3	1	3	3	3
4	2	1	2	3
5	2	2	3	1
6	2	3	1	2
7	3	1	3	2
8	3	2	1	3
9	3	3	2	1

1) Combined experiment with orthogonal arrays
2) Creating the factor effect chart
3) Estimate of the optimum by the factor effect chart

Factor effect chart



Estimate of the optimum by the factor effect chart

(1) In any case, **Minimize variation**
Enlarge S/N ratio … SN ratio = 10 log (m^2/σ^2)

(2) Then, **Match the mean**
Adjust with sensitivity … Sensitivity = 10 log (m^2)
We match the mean with the targeted value with having kept variation small

2) Basics of Taguchi method (4)
Confirmation experiment
(Experiment at the level of predicted control factor)

1) Predicting the level of control factor from the factor effect chart

(1) From SN ratio, set up level of control factors that lessens variations

(2) From Sensitivity, set up level of control factors that matches the mean with the targeted value

2) We perform an **experiment for confirmation** whether the target characteristics are met under the limit condition of the variation (N1, N2) that took an error factor into account

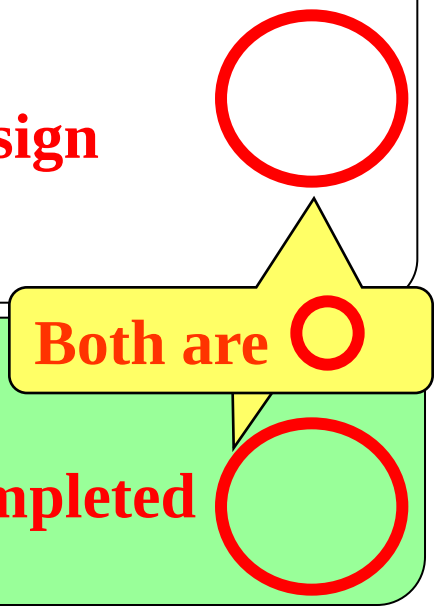
If basic design is a bad system, the limit of a system becomes clear

(Teaches early that there is no use to carry on)

→ **In this case, the decision for a fresh design start enables lean development**

If basic design is a good system,

a system of good quality with little variation is completed



3) Summary of Taguchi method (1)

Current quality field problems

barren money

Taguchi method is a tool that meets quality field problems

Development / Design Trouble in quality finish	The best tool for a quality finish
Factory Low yield ratio Hard-core large variations fresh start by lot rejection Hard-core overtime work and holiday work	A tool that puts its first priority to thoroughly suppress variation
Market Defective returned goods from customers There are many reworks	A tool that prioritizes customer viewpoint and puts its first priority to thoroughly meet the change of environmental condition in markets

C 3) Summary of Taguchi method (2)

Taguchi method is Dr. Taguchi's heartfelt appeal!
A theory that arose from "Companies must be strong in cost"

A theory suitable to fulfill the mission of the company

Company has to make good products early and cheaply

A theory for creating
little variation (good quality) products
from much variation (cheap) parts

A wise remark of Dr. Taguchi

"Quality first" crushes the company

D 3) Summary of Taguchi method (3)

Conventional experiment

As a result of demanding quality goods

Run into the Devil's Cycle

Suddenly

- We are going to make the most suitable thing
- We are going to make a thing of good quality

made thing is defective produc

Conventional type: Development type to prevent from repeating failures

Experiment of Taguchi method

Two phases of designs

Defective products are rather made

Development type to solve the problem beforehand with Taguchi method

- Minimize variation (first phase)
- We find the optimum (second phase)

We make quality goods with a confirmation experiment

No never-ending cycle

Straight to the result

Sure approach

4. Application to software

Effect of Introduction

Utilizing ”orthogonal array,

- excellent time efficiency and
- increase in bug discovery rate

were tried

I hope that you utilize it hereafter
for “bug elimination on the market”

4-1) Why are combination tests difficult?
Are combination tests done?

(1) Combination condition number is enormous ▲～×

For 100% combination for 3 factors

Hundreds of thousands to several million module level cases

Number of cases realistically testable is less than 1,000

(2) Difficult to separate accurately ×

because of complicated conditions

(3) Number of tests further goes up ×

by state transitions through combined conditions

In traditional testing, no remedy but evidently to take second best

→

Inescapably, introduction of combination bugs

4-2）What is an Orthogonal array?

- **Usually uses the 2 Level System (2, 4, 8, 16, 32, 64, 128, 256, …)**

［Column］ Corresponds to function for software verification

［Row］ Corresponds to verification number for software verification

# of levels	# of levels	# of levels	# of levels	# of levels	# of levels	# of levels
4	4	4	4	2	2	2

	column 1	column 2	column 3	column 4	column 5	column 6	column 7
row 1	1	1	1	1	1	1	1
row 2	1	2	2	2	1	2	2
row 3	1	3	3	3	2	1	2
row 4	1	4	4	4	2	2	1
row 5	2	1	2	4	2	1	2
row 6	2	2	1	3	2	2	1
row 7	2	3	4	2	1	1	1
row 8	2	4	3	1	1	2	2
row 9	3	1	3	2	2	2	1
row 10	3	2	4	1	2	1	2
row 11	3	3	1	4	1	2	2
row 12	3	4	2	3	1	1	1
row 13	4	1	4	3	1	2	2
row 14	4	2	3	4	1	1	1
row 15	4	3	2	1	2	2	1
row 16	4	4	1	2	2	1	2

Combination of columns 1 and 2

Levels 1 to 4 for column 1
Levels 1 to 4 also for column 2

Each of the combinations of each level of columns 1 and 2 appears once:
1–1, 2–3, 3–4, etc.

Combination of columns 4 and 5

Levels 1 to 4 for column 4
Levels 1 to 2 for column 5

Each of the combinations of each level of columns 4 and 5 appears twice:
1–1, 2–1, 3–2, etc.

Combination of columns 6 and 7

Levels 1 to 2 for column 6
Levels 1 to 2 also for column 5

Each of the combinations of each level of Columns 6 and 7 appears four times:
1–1, 1–2, 2–1 and 2–2

4-3) Characteristics of Orthogonal array

1) All the levels described by 1 factor (1 function) can be checked
(100% cover rate)

2) All the combinations of 2 factors (2 functions) can be checked
(The greatest characteristic ･･･100% cover rate)

3) Combinations of 3 factors (3 functions) can be checked
with about 60% to 80% cover rate, unintentionally

4) Combinations of 4 factors (4 functions) can be checked
with about 30% to 50% cover rate, unintentionally

5) near to 100% cover rate possible as relation combinations
(assuming inputs of
every 5 years for years and every 3 days for days
because the numbers of them are large)

4-4) Embedded software test method using orthogonal array

MOSTEST method (Method using Orthogonal array for Software Evaluation Testing)

Feature / Effect

Some creative thinking in the orthogonal array

- Realizes **100% cover rate** (2 factor combination test) using orthogonal arrays based on Taguchi method with **excellent time efficiency** and **accuracy**

Secure discovery of state transition paths

Overview of MOST's software verification tool

1. Enter the relationships between condition factors and configuration factors
2. Enter simple factors and their levels

1. Enter state transition relations
2. Clarifies needed tests (automatically)
3. Enter factors and their levels

Automatically finds the optimal orthogonal array from the arranged 1909 kinds (variants of L256, L128, L64, L32, L16) , and automatically generates an orthogonal array (describing factors and levels) for bug verification

- 2 level system L16 max 16 factors, L8 max 25 factors, L4 max 32 factors, L2 levels max 254
- Simultaneous processing possible for 4 kinds of factor (One of L16, L8, L4 or L2)
- Level of configuration factors is one of L16, L8, L4 or L2

(level # of condition factor 1 * level # of condition factor 2 * level # of condition factor 3 * level # of condition factor 4 * level # of configuration factor <= 256)

5-1) Taguchi method practical case introduction

Shoudai-Daini Municipal Elementary School,
Yanagawa City, Fukuoka Prefecture
(Unwittingly practicing Taguchi method truly)

National winner in
31-legged race!

Question
“What kind of derby is the 31-legged race?”

Answers of many
“One to run keeping steps with each other???”

What kind of approach did they take?

Taguchi method vision
to all day-to-day affairs!

1. What is the basic function?

"31-legged race" is a derby running

"the same number of steps" "at the same speed" "keeping in line"

2. How was the goal set?

All ran 50 meters one at a time

Quality control method

Number of steps: central value of all was 34 steps

Speed: time level of national winner was 9.2 seconds

3. What kind of practice was taken?

All purchased a stopwatch

Nothing was created

Practiced to count 34 in 9.2 seconds

4. How was the variation?

Wonder: Wow, variation of 0.03 seconds!

Time at national championship

Less than Olympian in the 100m

Game 1: 9.29s Game 2: 9.26s Semifinal: 9.28s Final: 9.28s

6) Approaches and management for people who don't know Taguchi method

The approach and management for research / development / design that is firmly believed to be best and performed everyday by almost all the people who do not use Taguchi method:

Recurrence prevention type development

1) design it
2) make a trial product
3) detect malfunction
4) study a cause of malfunction
5) remove the cause of malfunction
6) change the design to adjust to the standard

6）raise the completeness by repeating the process 1) - 6) many times

7）Whenever malfunction happens in the market, より厳しい test method is added and a severer evaluation standard is set

Let's immediately stop with such an inefficient approach and management that lacks logic!

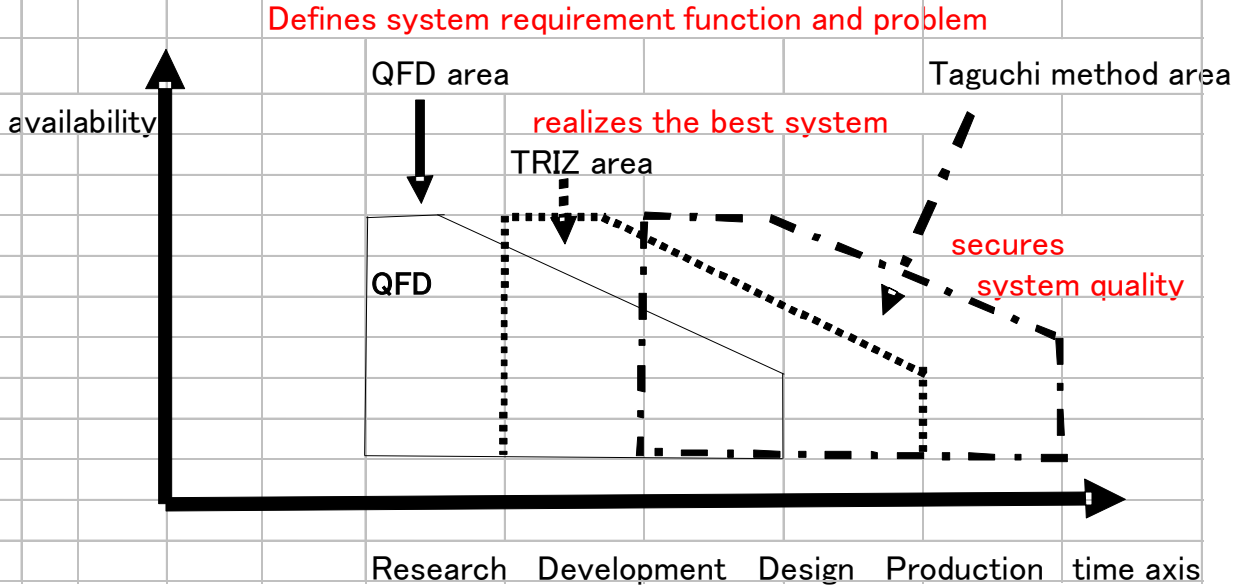
New technical field development → proactive type development → Taguchi method

III-1) Summary
Creative problem solving process and scientific methods

To use TRIZ well, "QFD" and "Taguchi method" must be used well changing the time

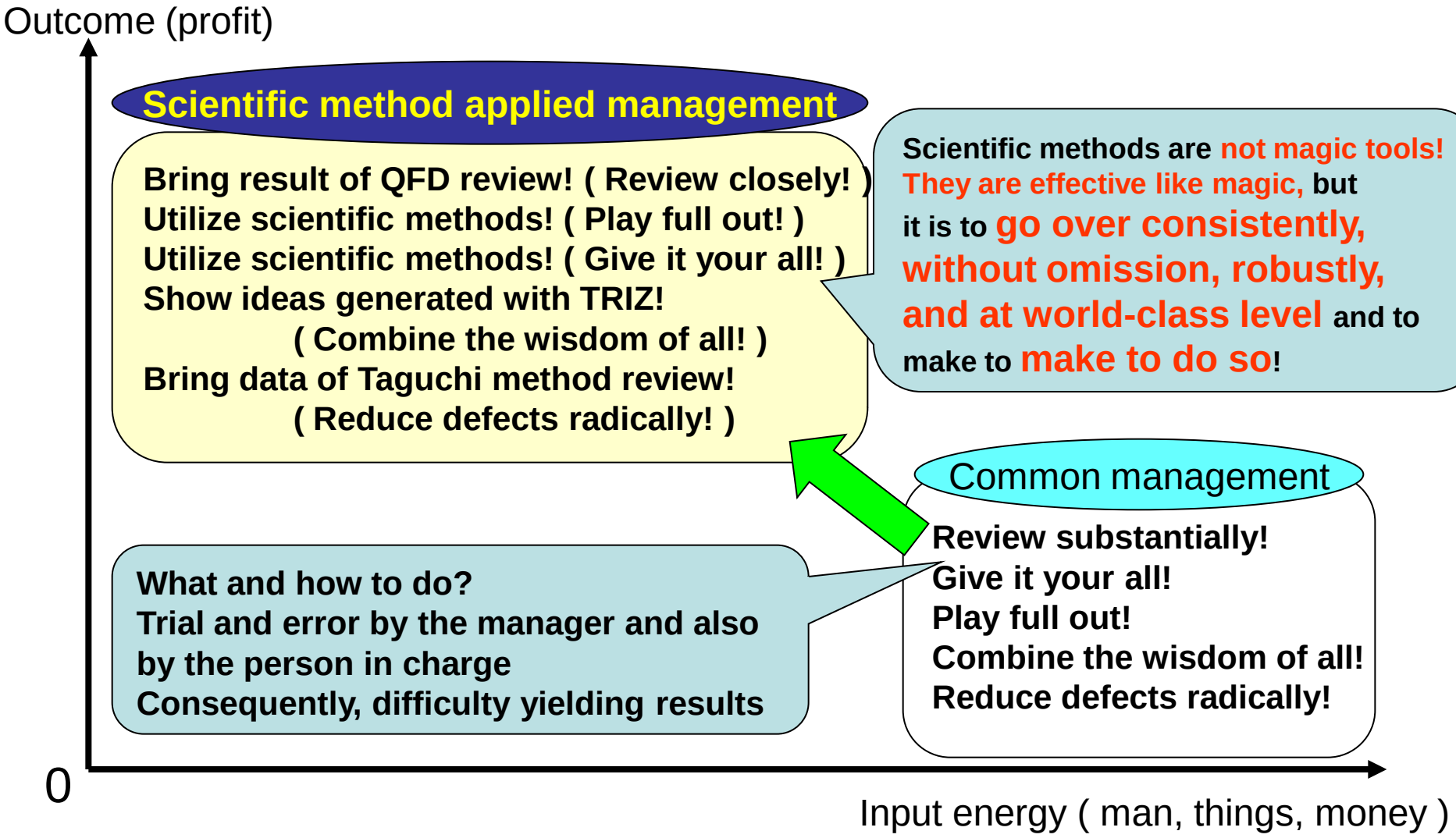
The relation among the 3 major methods is that none of them is superior to the others

There are only time lags in their activities



III-2) Summary

Difference between scientific method utilization and common management!



III-3) Summary

What is TRIZ for managers!

1. Clarification of goals (The higher the goal, the better)

… QFD

Product concept (goal)

2. Research and Development … What kind of thing can be technically done?

Design … We want to largely lower component cost

TRIZ

Schema clarification on the desk (with the brain only)

(Product creation that makes positive impression on customers)

- Embodiment on the desk (brain only)
- Foresee the future (from tactics to strategies)

Concrete product concept

Enables structure determination of a perfect system that is good in QCD

3. ＊System configuration ideas to ensure the quality requested by the customers and determine concrete condition setting (set value) at product creation
＊pinpoint the true factor of large variations and determine the improve conditions
＊Determine the conditions so that quality can be ensured even with cheap materials
＊Determine operating condition of equipment in the factory

Taguchi method

Products creation tolerant of error conditions

Thank you for your attention!

I hope that you will further improve your management

by acquiring or making to acquire good methods and

performing good management (utilization of scientific methods)