

Appendix H

A Procedure and Format for the Thinking and Action of "Abduction, Verification, Evaluation and Decision Making" to Reveal Rational Past Mechanisms and to Create Future Mechanisms.

by

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Abstract

There is a strong need to clarify how to proceed with thinking and action in the processes of "Abduction, Verification, Evaluation and Decision-Making for past matters and future matters," whereas they are often thought to be alike.

- (1) In particular, it is necessary to clarify how to visually proceed with abduction among people.
- (2) Also, it is necessary to clarify how to change the thinking and processes of "Abduction, Verification, Evaluation and Decision-Making" between that for past matters and that for future matters.
- (3) At the present time, there is a very clear process for verifying past matters using conventional scientific methodology, but the process for clarifying future matters using only conventional scientific methods is very vague.

As a result, we have to establish a clear academic discipline for the methodology of this process. This paper answers these question and needs.

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Thesis Statement

1. Cards and forms make the working process of thinking visual using the language of abduction, verification, evaluation and decision-making.
2. This clarifies that within the processes of abduction, verification, evaluation and decision-making there are sub-processes of abduction, verification, evaluation and decision-making.
3. The contents of evaluation and evaluation standards, which are necessary for the processes of abduction, verification, evaluation and decision-making, are clarified by identifying the relationship between the value direction and the phased input and output appearing in the cards and forms.
4. The abduction method and hypotheses which have not been explained previously in the process of abductive, inductive or deductive thinking are explained.
5. The abduction mechanism allows us to build a theory in which abduction is seen as a conversation between the front brain and the back brain, whereas we can think of inductive thinking as a conversation between the left and right brains, starting in the right, and deductive thinking as a conversation between the left and right brains, starting in the left.

These are explained and became the visible methodology using DTCN/DTC methodology.

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1. Introduction

The following issues and questions concerning the processes of abduction, verification, evaluation and decision-making have not been answered.

- (1) Abduction is not like induction or deduction. It has been said that without inspiration there is no way for abduction to exist. (C.S. Peirce, Masakazu Nakayama, etc.) [1][2] However, isn't it possible for us to rationalize the mechanism of abduction and express it in a visual form or method process for use among the people concerned?
- (2) The author and others believe there are two types of abduction. They are abduction to create future-oriented mechanisms and abduction to explain past-oriented mechanisms. There are few theses which discuss their use, or the similarities, relationships and differences between them. There is a need for information on the abduction method on the Internet. Are there any good ways to explain the uses and methods of future-oriented abduction and past-oriented abduction?
- (3) The contents and processes of abduction, verification, evaluation and decision-making to explain mechanisms of current or past phenomena have been clarified. People often use the terms future verification or future evaluation to express the contents and process of verification and evaluation when creating future management mechanisms or estimating natural mechanisms. However, there are areas which are still vague, while we are doing this under consciousness; for example, what is sufficient in the contents and process?

We have found few instructions or theses which outline what should be satisfactory for the contents or processes.

Can we not create a thesis that clarifies everything?

The thesis of this paper responds to the above questions and needs.

2. The processes, thinking, and action of abduction, verification, evaluation and decision-making to create future-oriented mechanisms

Among the methods which the author has developed are DTCN and DTC [3], [4] (DTCN: Design to Customer's Needs; DTC: Design to Cost). The author believes that the processes, thinking and actions of abduction, verification, and decision-making are the same as those of the Purpose Measure Diagram (PMD) Method and the process in the Steplist Method, which moves from an inductive approach to a deductive approach in DTNC/DTC. The following charts explain this. (Note: In this paper, all figures and tables are called as chart)

Chart 1 summarizes DTCN/DTC and indicates the positions of the PMD (Purpose Measure Diagram), the Steplist Method, and the FBS (Function Breakdown Structure) Method. The chart helps to clarify what DTCN/DTC is. [3]

Chart 2 outlines the PMD Method.

Chart 3 summarizes the Steplist Management Method.

Chart 4 and Chart 5 illustrate an actual example in which a student completes a graduation thesis. The completion of the thesis is the focused future and is identified as the future abduction. The charts show the rational processes needed to materialize the future abduction, future verification, future evaluation, and future decision-making. (In this case, the decision-making is to start writing the core part of the graduation thesis and then move to actions complete).

Chart 6 compares actual examples of artificial past and future-oriented steps of abduction, verification, evaluation, and decision-making, and future-oriented abduction, verification, evaluation, decision-making, implementation and *ex post facto* evaluation with the contrasting DTCN/DTC phased steps in the right side column.

To explain conventional abduction, verification, evaluation, affirmation and/or decision-making steps, Chart 7 attempts to portray the relationship framework between a past-oriented explanation of a natural mechanism (upper left), a past-oriented explanation of an artificial mechanism (bottom left) which can be divided into "intentional" or "accidental", and a future-oriented forecast of a natural mechanism (upper right), to correspond to the pattern of abduction, verification, evaluation and decision-making to create future-oriented mechanisms that are based on each stage of the PMD and Steplist. (bottom right) which were shown in Chart 6.

The following charts explain in detail how to fill in the framework of Chart 7.

Chart 8 shows the Result Cause Diagram (RCD) Method and Future Result-Cause Diagram (FRCD) Method compared with the PMD Method. The RCD Method is a new abduction method that

explains the past-oriented mechanisms concept starting from the future management-style abduction method of PMD. The FRCD Method is a new abduction method that forecasts the mechanisms of future natural phenomena .

A PMD can produce a keyword (expression of future-oriented abduction) around the center by applying "In order to . . .how to" structured answers to the questions of "What are we going to do with it?", and "What is enough to do? "or "What should be done, at least ?", - the same as implications of something - objective and do - action- in the purpose and measure model.

- (1) An RCD is a concept model for getting a past-oriented abduction expression, which is the key to finding the relationships between result and cause without gaps using cards showing combinations of something - subjective, and do -existence, which correspond to what must have caused the current visual result facts or phenomena.
- (2) An FRCD (Future Result Cause Diagram) displays a concept model for getting a future-oriented abduction expression, which is the key to finding the relationships between cause and result without gaps using cards showing combinations of something - subjective, and do-existence, which respond to what should cause such a future phenomena.

It is easy to find what is missing if there are diagrams of PMD, RCD and FRCD vertically and cards/photos that include the purpose/result or current facts are attached just above the visual line to fill in the gaps in the vertical line.

Chart 9 is RCD method example of abduction for explaining past-oriented artificial mechanisms (intentional).

Chart 10 is an RCD method example of abduction for explaining past-oriented artificial mechanisms (accidental or we say sometime by mistake).

Chart 11 is an RCD method example of abduction for past-oriented natural mechanisms.

Chart 12 is an FRCD method example of abduction for future-oriented natural mechanisms.

Chart 13 is the general clarification chart for language usage, the working context and examples for abduction, verification, evaluation, decision-making to materialize, affirm, implement and *ex post facto* evaluate each case.

3. Process integration of abduction, verification, evaluation, affirmation and decision-making for the future and past

Chart 14 is an integrated flow diagram that illustrates the relationships of the process of verification, evaluation, and affirmation or decision-making by the PMD, RCD, and FRCD Methods

in charts 4, 9, 10 and 11, and their Steplist forms. From these charts, we understand that they should be positioned and linked to shape PMD + abduction, verification, evaluation and decision-making for future management use.

Some people do abduction and research even without clarifying whether their research will be useful or not. If the research may be useful in the future, it is necessary to have links to a keyword or PMD-style thesaurus to help pick up results whenever necessary. This should be the researcher's mission in society.

4. Main process of Abduction, Verification, Evaluation and Decision-making vs. the Sub-process of Abduction, Verification, Evaluation and Decision-making

Chart 15 illustrates the development of a desk for easy study in order to explain the relationships between the main and sub-processes of abduction, verification, evaluation and decision-making.

The sub-processes of abduction, verification, evaluation and decision-making at each stage on the right of the chart correspond to the processes of abduction, verification, evaluation and decision-making on the left of the chart.

When we acknowledge and define that abduction, verification, evaluation and decision-making are both broad and narrow processes, we can avoid the chaos of having a unified language for abduction, verification, evaluation and decision-making.

5. Definition of *evaluation* and *evaluation standard*

(5.1) What the word "*evaluation*" means:

If we consider that evaluation has two meanings, we can avoid the problem of how to use the word with respect to content and operation.

(1) In English the word "*evaluate*" has the same meaning as *hyoka* in Japanese, from which we draw the meanings of "*strengthen value*", "*create value*", and "*extract value*". In particular, "*create value*" means *to combine future objects with contents and current objects with contents after verification*. Furthermore, "*the operation of evaluation*" which comes after "*the operation of verification*", can mean to create values for combinations of whatever comes out after verification.

(2) "Evaluation" has another meaning, that is, to compare and evaluate to select the value created or

combination as above

Therefore, using the word “evaluation” to mean creating a value and “evaluating” to select removes confusion about the usage of the word, “evaluate”.

(5.2) Having an evaluation standard is essential during decision-making.

The following explains how the word, “*evaluation standard*” should be put into concrete form using PMD and Steplists during decision-making and its contents.

The author (Professor Esaki) has put forward the thesis “Decision-making Mechanism by Information of Difference” [3][5][6]

- (1) In this paper, Professor Esaki stated that decision-making is done by comparing the vectors of information of difference and value direction; the information of difference can be obtained only by comparing two ideas or by comparing one idea and a standard. (Note: “do” and “do not” comprise two comparative ideas. In addition, the author stated that a PMD (diagram of purpose and measure) can indicate the value direction. Therefore, evaluation standards have to include the value direction shown by a PMD. Next, we will put this into the process of future-oriented verification, evaluation, decision-making and materialization.

Using chart 2 and chart 3, we can see that there are several phased operations and phased decision-making stages for creating something new.

At each stage of phased decision-making, an evaluation standard is necessary. This evaluation standard corresponds to the left side of chart 3, which explains the insuring conditions in the post-assurance operation of each stage of output. In this case, it means to know the customers’ taste.

The other side is the PMD direction, which shows the total value of the project.

Chart 16, on the other hand, shows the transitional swinging width on the graph below the estimate grade ranking, which traces the process of how to focus on a concrete idea step by step in phases of projects. From this transition, we understand that the allowances change along with the phase of the evaluation standard.

(2) Summary of phased evaluation and evaluation standard

We can summarize the final results for evaluation and evaluation standard so that we can make them useful to society.

- A. First, we will understand the condition of value direction by PMD, or RCD/FRCD and summarize the abduction expression (key word) with cards.
- B. Using Steplists, which show phased thinking and action (refer to chart 3), we can decide on the

assurance condition of allowance in decision-making with swinging width (concept) within the Steplist framework. The swinging width corresponds to each item in the post-assurance box as the assurance condition of the decision-making process which is transmitted from the previous output phase to the next input phase.

- C. The concept of swinging width in the assurance condition at each phase is shown in the estimate grade ranking in chart 16.
 - D. After completing the above procedures, we can finally define the evaluation standard for phased decision-making.
- (3) Summary of (1) and (2) using PMD expressions can be visualized in chart 17, “PMD (purpose and measure diagram)”, which positions the meaning and content of *evaluate* and *evaluation standard* relative to the use of DTCN/DTC (=Advanced Project Management Methodology [4]).

6. Hypothesis for information flow/integration of the processes of abduction, induction and deduction within the brain

The author (Professor Esaki) mentions the following hypothetical results in references [3] (Episode 1, and Episode 7 in [4]) (Also in [7][8])
(Chart 18)

- (1) When we understand, we nod. When we understand the keyword or upper level of a keyword, we nod our heads down first.

When we understand the measure or meaning, we nod up first. (There are a very few ethnic groups which do not do so. We will not discuss them here.)

We hypothesize that when understanding the purpose, information is sent to the upper brain and when understanding the measure, information is sent to the lower brain and stored. It has been observed that most people in the world do this. From this, we further suppose that the front and back brain talk to each other.

This pattern corresponds to the shape of a PMD, which indicates the upper direction as the purpose and the lower direction as the measure.

- (2) We usually shake heads when saying “no”. We shake heads to the left first when saying “no” logically, and shake heads to the right first when saying “no” emotionally. (The rate of exception in this case is about 4% for Japanese and about 6% for Americans. This will not be discussed further here.)

We think that shaking heads to the right is to send and check logical information from the left brain for logical negation and shaking heads to the left is to send and check sense information from the right brain for sense negation. From this, we hypothesize that the left and right brain converse. This pattern corresponds to the process of “input item, pre-assurance operation, output item, and post-assurance operation” in the Steplists. It also corresponds to the process of “Theme, keyword, comparative idea creation, and selection of ideas” in the FBS diagram of the FBS technique, as shown in chart 19.

(3) Hypothetical comparison of abduction, induction, and reduction based on the hypothetical results.

A. Abductive thinking corresponds to the conversation between the front and back brain.

The conversation between the front and back brain starts from either side or sometimes simultaneously. When we understand the level of keyword well, we do not shake our head up and down. This shows that the level of conversation between the upper and lower brain comes to the level of the keyword and this seems to explain the condition in the brain when abduction occurs. Therefore, the hypothesis that the abduction process is a conversation between the upper and lower or front and back brain can be accepted together with item B.

B. Inductive and deductive thinking correspond to the conversation between the left and right brain.

Generally, a conversation starting from the right brain spreads from a variety of images. This is the order of the inductive approach. A conversation starting from the left brain is begun from a certain deductive style which is the order of the deductive approach.

C. Summary

In the past, inductive thinking was recognized as thinking of various things or such a way of thinking. Deductive thinking, on the other hand, was explained as thinking in a unified way or such a way of thinking.

This thesis and the previous thesis made the following conclusions:

* PMD is able to express, explain and implement so that we can visualize abduction using the purpose, measure, and keyword as core expressions to appeal to the majority.

* From the PMD diagram, the integrated observation that shows we shake our head back and forth when understanding something allows us to form the hypothesis that a PMD, the way of abduction, is a conversation between the front and back brain.

Therefore, by integrating this observation with the methods of PMD, RCD, FRCD and Steplists, we have a hypothesis for explaining the process of abduction, verification, evaluation, affirmation and decision-making as a conversation within the brain. Furthermore, we have begun one of the verifications based on the above explanation.

7. Summary

We stated our hypothesis that the conversation between the front and back or between the left and right brain corresponds to a mechanism of abduction, verification, evaluation, and decision-making or process of abduction, induction or deduction, up to chapter 6.

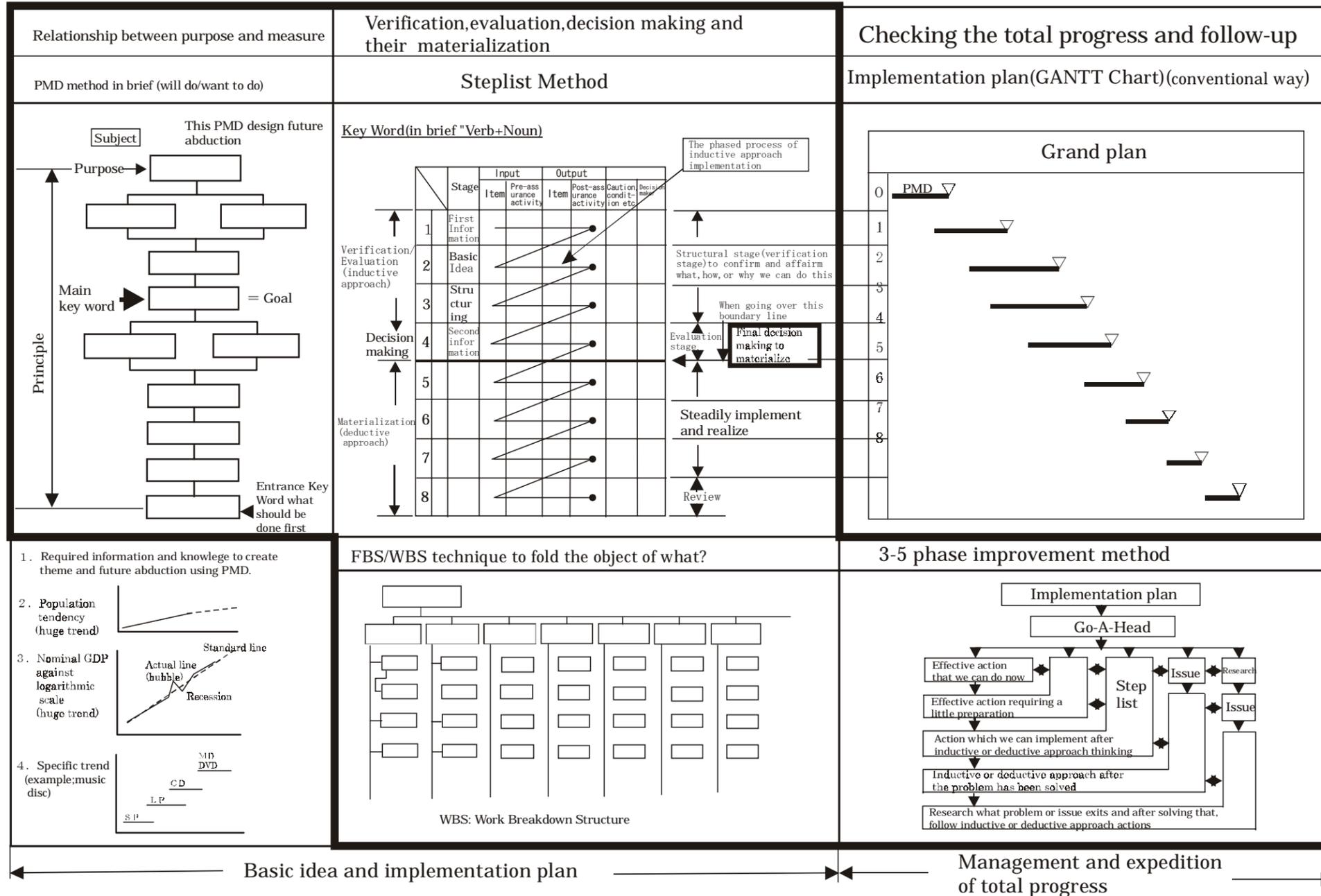
In the future, we would like to cooperate with other researchers to evaluate and verify our hypothesis and apply this mechanism to computers and computer networks to achieve the uppermost purpose of DTCN/ DTC, i.e., to protect the earth, create customers, and satisfy the customers.

References

- [1] Masakazu Nakayama, Induction, Deduction, and Abduction, Sanno-University Press, 1979
- [2] Ken Tobioka, Abduction, Goma Books, 1994
- [3] Michihiko Esaki, The Method of DTCN/DTC, ASCII Press, 1997
- [4] Michihiko Esaki, Advanced Project Management Methodology, on CD-ROM, DTCN International Inc.
- [5] Michihiko Esaki, Method for Decision-making in Management, 1977
- [6] Michihiko Esaki, A Decision-making Method for Management, Proceedings of the International Conference of Production Research, 1974
- [7] Michihiko Esaki, Sexual Differences in Transmitting and Accepting of Image, Japan Creation Society Thesis,
- [8] Michihiko Esaki, Sexual Differences in Transmitting and Accepting of Image, Proceedings of the International Image Conference, Fukuoka, 1987

Chart 1 Overall summary of DTCN/DTC (Enclosed with thick line)

Method of visualizing and sharing a process of "clarifying the relationship between purpose and measure, verification, evaluation, decision making and matrealization, which creates future-oriented mechanisms.



Extracted and revised from Effective Plan Making and How to Succeed a Plan(Hisaya Hirose.Master thesis at Asahi University,1999

Chart 2 : PMD Method

Outline of PMD Method (KEY WORD METHOD)

PMD(Purpose Measure Diagram)

The PMD method and other techniques related to DTCN/DTC are methods which allow us to visualize a map on paper of what we have been doing consciously in our way of thinking and action

Using the PMD method, we can lineup cards vertically in the relation of purpose and measure, understand the focus of issues and clues to realizing the goal and adjust the vectors of the people concerned visually. The cards include as much as information as is available, i.e. what we want to do, and in brief what must be done.

Essential points of the PMD method

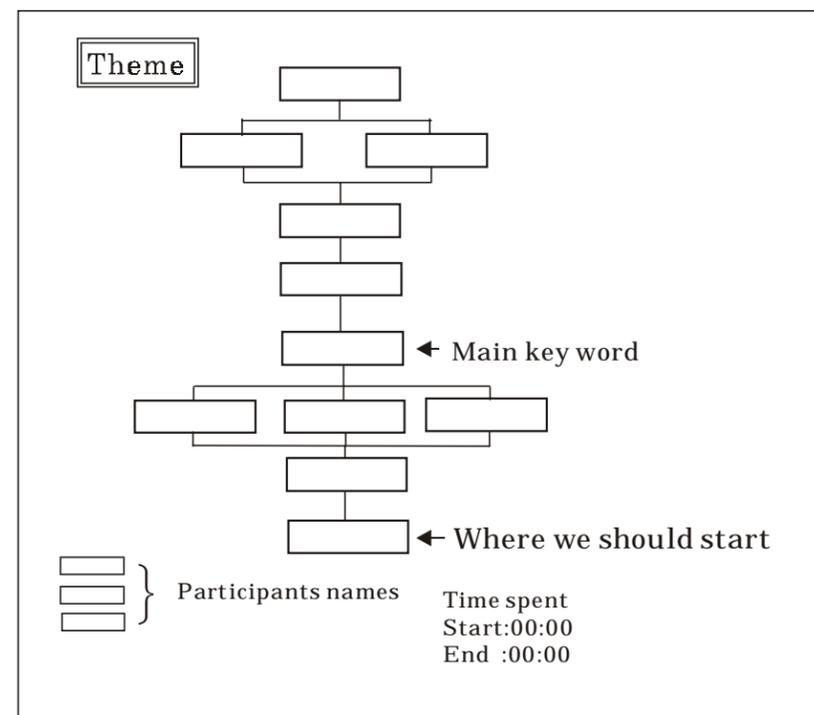
An individual, or group of people can do the following by using this method.

Create and agree on the purpose measure relationship. Especially when starting something which has not been done before.

We can:

- 1) Grasp the appropriate expression of the objective result(goal) : (main key word).
- 2) Visualize the direction of the value for the same decision-making.
- 3) Clarify the entrance key word, that is, where we start.

The image of PMD diagram



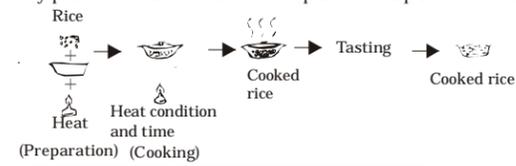
Essential points of procedure of the PMD method

1. Decide on the theme.
2. Ask the following questions about the theme:
 - 1) In brief, what are we going to do with it.
 - 2) As a minimum, what must be done?
3. Write down answers on paper using "verb+noun" expression of with few adverbs or adjectives.
4. Cut each expression out.
5. Comparing two them in twos, line them vertically based on the purpose measure relationship between them as much as possible. When an expression cannot be arranged, put it on the horizontal line at the same level.
6. Add card expression that are missing in a sequence of purpose-measure relationships vertically by any means.
7. Search the diagram from top to bottom for the most appropriate expression level for the issue based on purpose and measure.
8. The bottom expression of the purpose and measure is the expression of the entrance key word, that is, where we should start in order to realize the main key word.

Chart 3 : Outline of Steplist Management Method

- Create a phased procedure (Method for perfecting procedure roughly established by PMD).
- This method is used when someone is already focused on what they want to do.

(1) 4-boxes-acknowledgement to extract every possible causal element of input and output relationship.



Put in the key word which was using PMD method

Input		Output	
Item	Pre-assurance activity	Item	Post-assurance activity
Item	Operation	Item	Confirmation
	Assurance condition		Assurance condition

From to extract all development stage operation items. (Steplist)

Item _____ Sub-title _____ Phased decision plan _____ Top manager _____ Date _____
 Promotional secretary _____

Segment	Basic step	Step content	Input		Output		Other conditions	Who approved the output to the next step and date of record
			Item	Pre-assurance action	Item	Post-assurance action		
Various thought stage Inductive stage	1	First information collection	→	→	→	→		
	2	Basic idea	→	→	→	→		
	3	Structuring	→	→	→	→		
	4	Second information collection to back up the structuring	→	→	→	→		
Realization stage Deductive approach stage	5	Base design or basic matter	→	→	→	→		Put the name of the goal gained from the key word expression and create a procedure linked with the input in step 1.
	6	Detailed design or detailed matter	→	→	→	→		
	7	Prototype or implementation	→	→	→	→		
	8	Review and correction	→	→	→	→		

We can do following through Steplist management.

When facing a highly complex issue, PMD helps us to understand the purpose-measure relationship and rough procedure necessary to realize the solution of the issue. The Steplist Management Method makes it possible to create faultless phased procedure for more detailed thinking and action to reach the objective results. Therefore, using the steplist form, we can:

- (1) Arrange the process within a concept.
- (2) Create the appropriate framework of the relationship between people offer and proper acceptance.
- (3) Create the appropriate evaluation standard before, during and after action.
- (4) Locate the position where other conventional management techniques could be appropriately applied.
- (5) Create the framework of appropriate phased decision-making.

1. Acknowledgment of 4-boxes which can faultless pick up and identify the necessary elements in the input and output process.

Any kind of thinking or operation can be interpreted as the repetition of input and output.

As in "how to cook rice well", shown on left side of this page, placing elements of operation.steps into the 4-boxes makes it possible to pick up every possible item of thinking and operation as procedure without leaving anything out.

Causal relationship

Input Item	Pre-assurance action for output Operation item to create output item using input item	Output Item	Post-assurance action for output Action items to move to the next input item
Rice, heat, water	Cooking (Assurance condition) Heat condition and item	CcookedRice	Tasting and confirmation (Assurance condition) Know customer's tastes

2. Explanation of Steplist Form

Top 4 boxes ⇒ Inductive approach (Various thinking stage)

The bottom 4 boxes ⇒ Deductive approach (Implementation stage after thinking and deciding)

Vertical direction ⇒ Faultless phased operation to reach the goal.

Horizontal direction ⇒ Framework to pick up and allocate the element of each stage
 According to the relationship of input and output, to enter the next stage, add the necessary new elements to the output of the previous step and arrange them as the input for the next step.

3. Method to create phased operational procedure on Steplist Forms

Write the name of the goal corresponding to the main key word obtained from thePMD in column 7D in the chart.

Next, add the various input elements, such as current information, knowledge, or goods to 1B.

Then fill out the procedural elements by their causal relationship to the result in 7D and make up the phased procedure.

If it is not enough, add the necessary steps.

Chart 4 Sample Extract Abduction to Coreate Future-Oriented Management
 (Future Oriented Artificial PMD)
 PMD for completion of a graduation

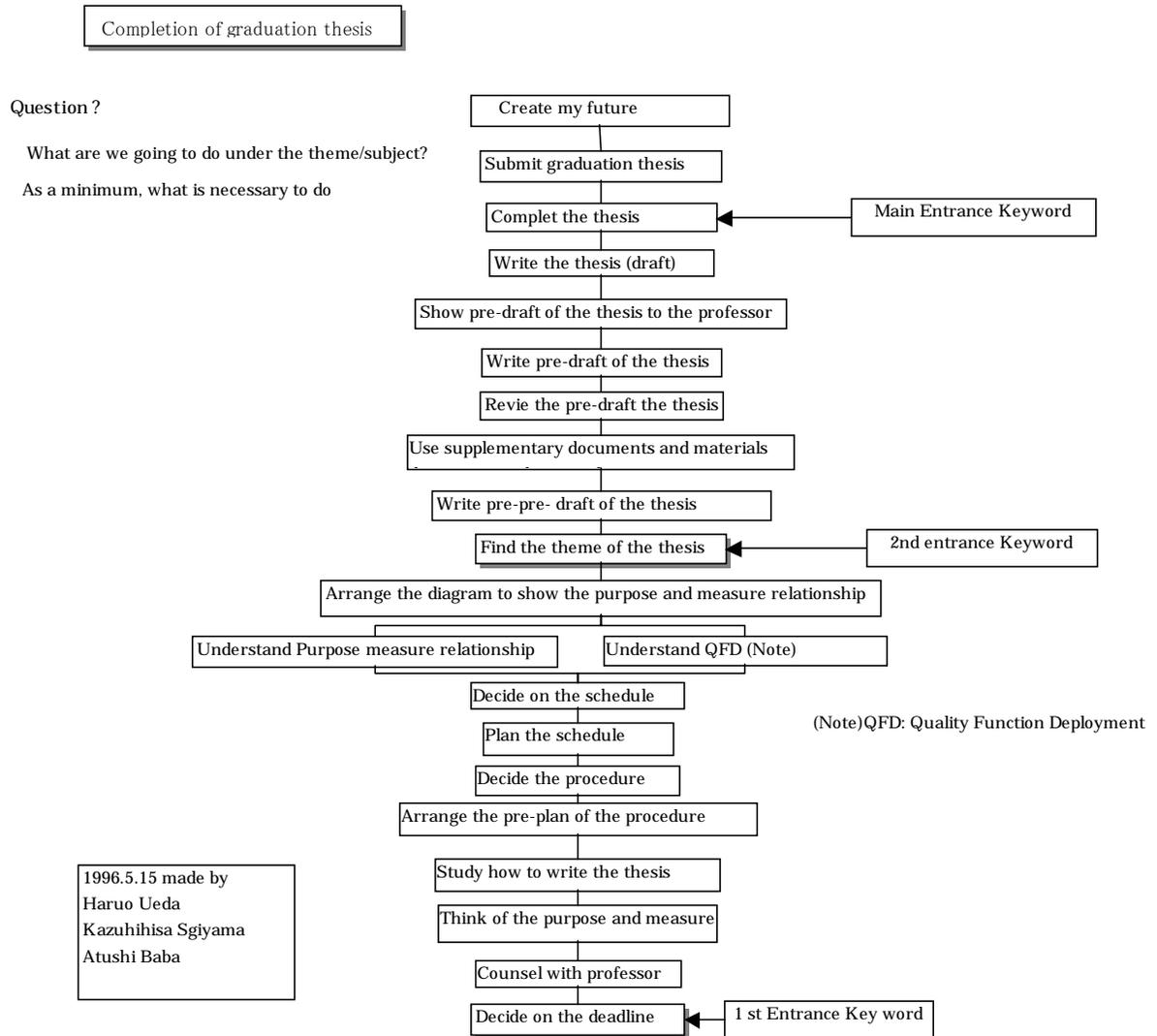


Chart 5 Causal relationship between the thinking and action of abduction, verification, decision-making and materialization based on a future-oriented PMD, Key Word and Steplist

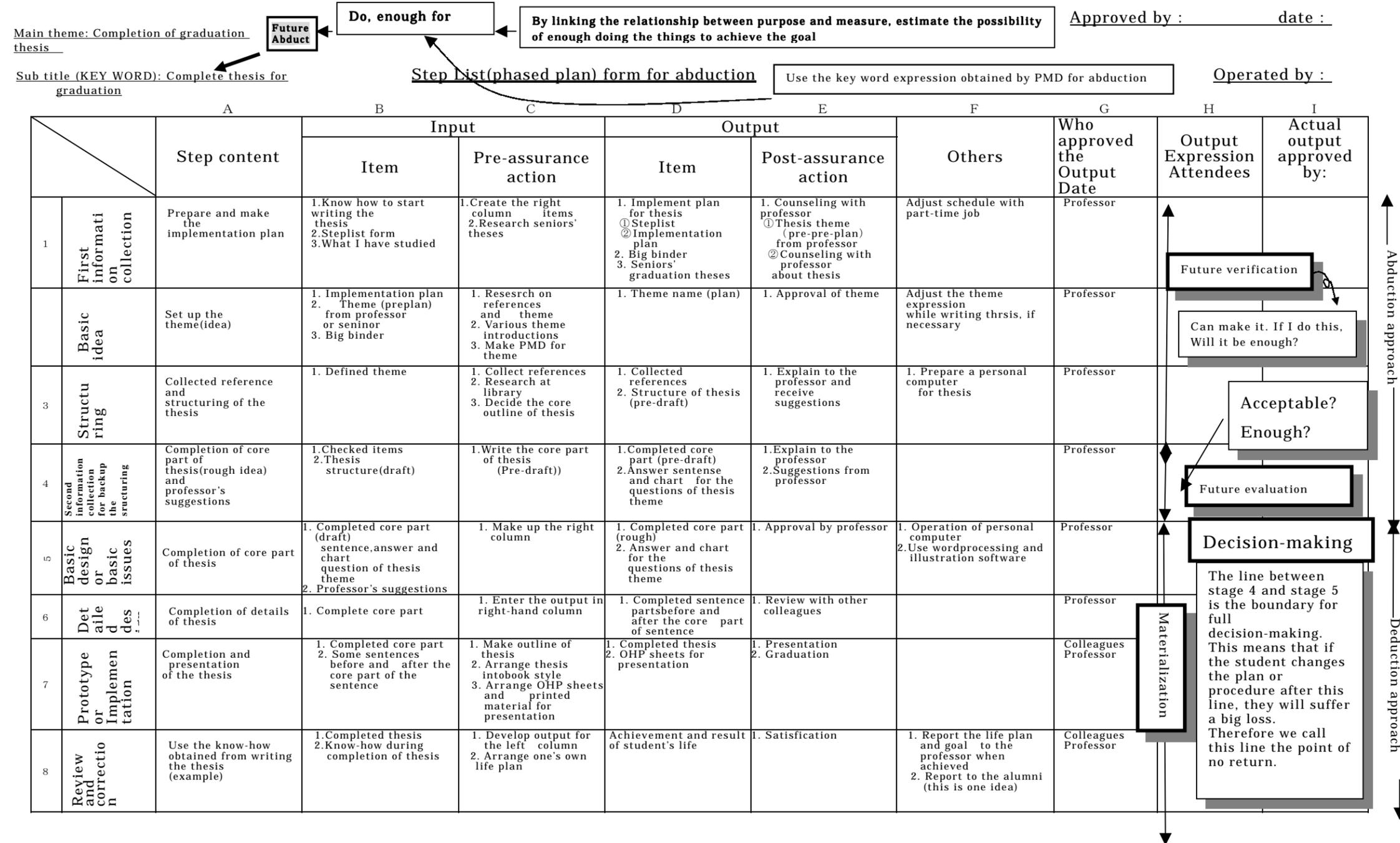


Chart : 6 Comparison of actual sample of artificial past-oriented steps of abduction, evaluation and decision-making and future-oriented abduction, verification, evaluation and decision-making

	Step segment	Actual past example	Concrete future example	Equivalent stage of DTCN/DTC
1	Abduction	Asahara must have committed the murder.	Only complete the graduation thesis.	Arrange PMD and find the key word
2	Verification	Only Asahara knows where the body was buried.	This will form the thesis.	The first information collection stage. Idea stage Structuring
3	Evaluation (creation of value)	Asahara is the Devil. He must receive the death sentence to prevent more crimes.	Are the contents of thesis good?	The second information collection stage
4	Final decision-making or affirmation (GO-AHEAD)	Death penalty verdict	Start work on the thesis using a word processor	
5	Implementation	Execution of death penalty	Presentation of thesis and graduation	Basic item stage Detailed item stage Implementation stage
6	Evaluation after incident	Book: <i>Asahara, The Life of the Devil</i>	<ul style="list-style-type: none"> • Use the experience of thesis(create the value) • Accept the effort of the thesis (E-value=create value) 	Review stage

Chart 7 : Thesis Viewpiont

The chart uses allow to indicate the viewpoints that explain the pattern of abduction, verification, evaluation, affirm or decision-making respectively: a past-oriented explanation of an artificial mechanism(bottom left) which can be "intentional" or "accidental", a past-oriented explanation of an natural mechanism(upper left), and a future-oriented forecast type of natural mechanism (upper right) , starting from the pattern that corresponds to "abduction, verificution, evaluation and drcision making to create future oriented mechanism(bottom right)using each stage of the PMD and steplist as shown on chart6.

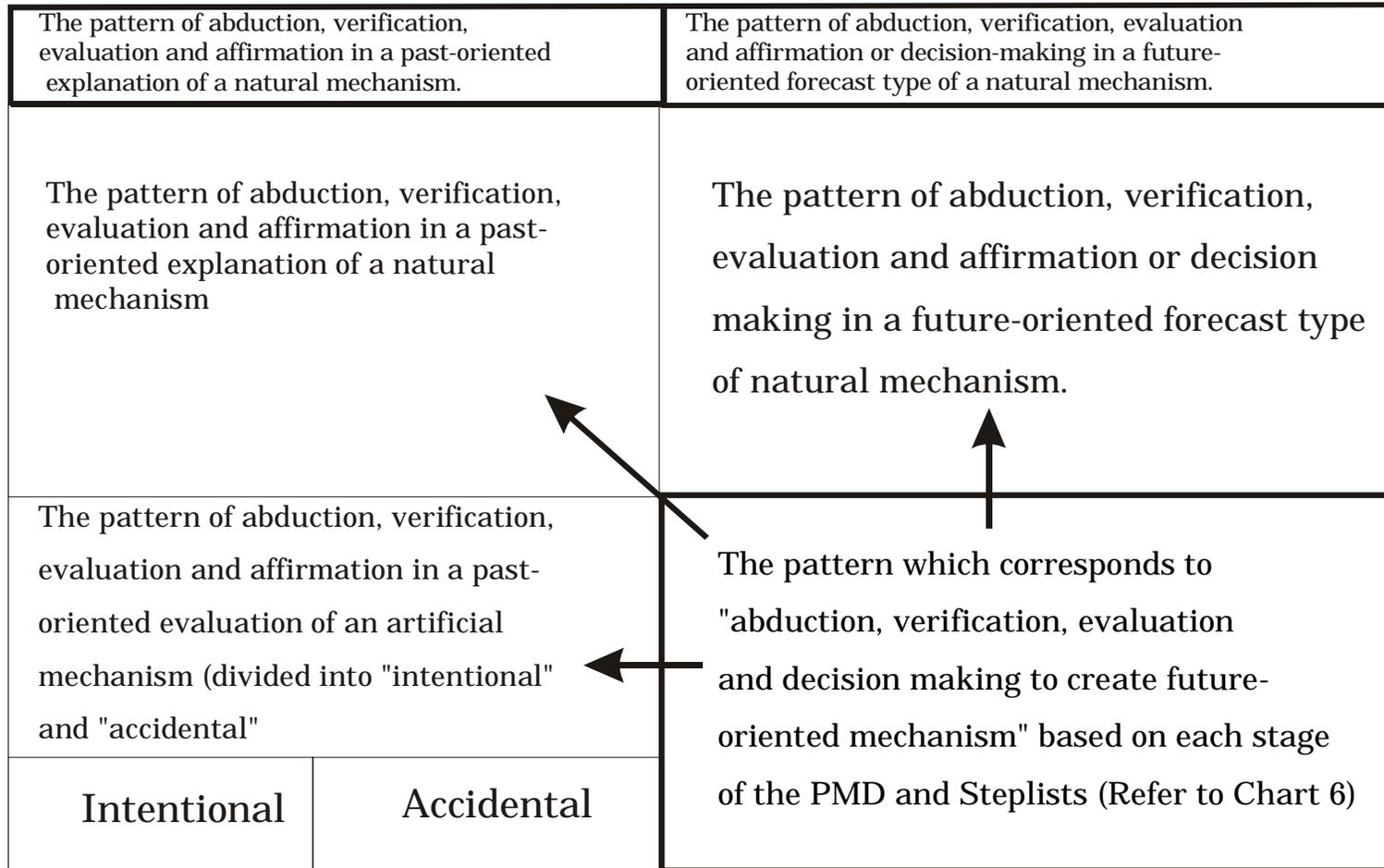
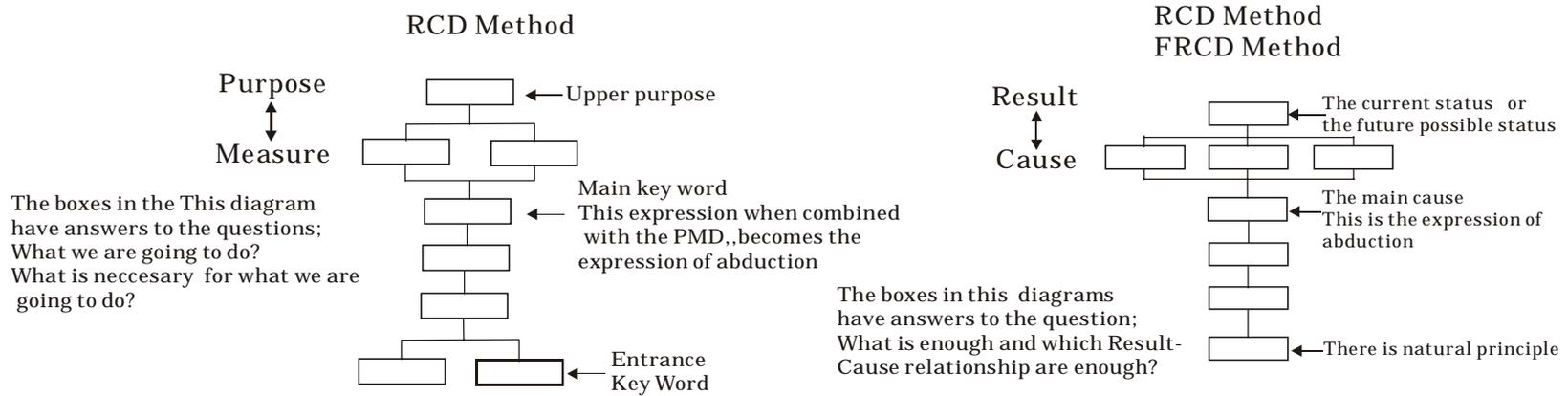


Chart 8: The RCD Method, a new method of abduction to explain past-oriented mechanisms and the FRCD Method, a new method of abduction to forecast future natural phenomena, starting from the future management style abduction method by a PMD (Purpose Measure Diagram)
 RCD (Result Cause Diagram), FRCD (Future Result Cause Diagram)



This visualization can combine and supplement the information, knowledge and wisdom of people concerned.
 This visualizes what is necessary to do to achieve the goal using PMD of the relationship of the cards to the people concerned.

This visualize what is the necessary cause for the result using an RCD of the relationship of each card to the people concerned.
 This visualizes what is necessary to do to achieve the goal using a PMD of the relationship of the cards to the people concerned.

Chart 9: RCD (Result Cause Diagram) Method - Example of Abduction for a Past-Oriented Explanation of a Past Mechanism (Intentional)

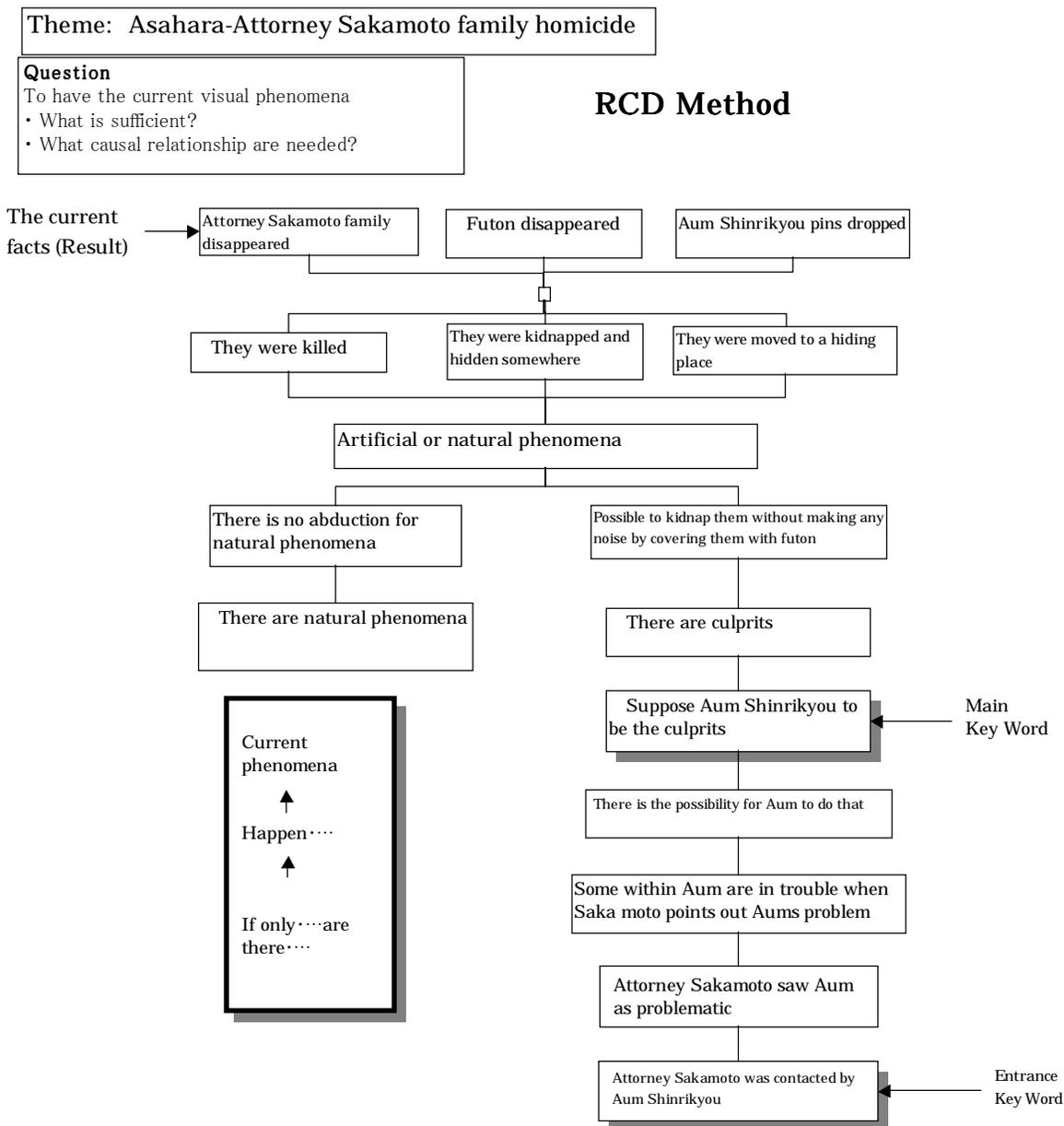
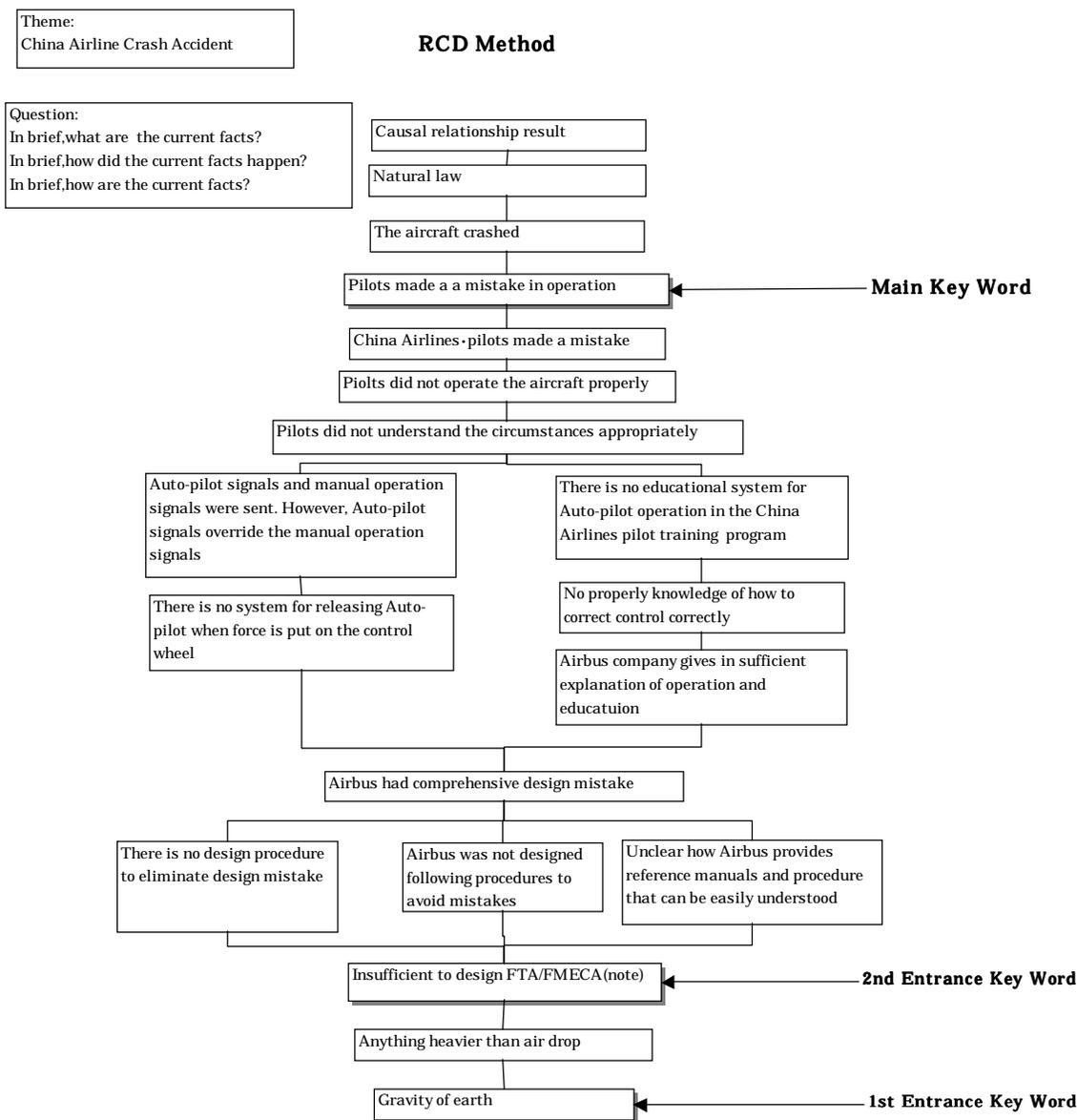


Chart 10: RCD (Result Cause Diagram)Method-Example of Abduction for a Past-Oriented Explanation of an Artificial Mechanism (Accidental)



Observation: How to design without mistakes? List every natural law and every aspect of human physiology. After that, design the aircraft.

(Note) FMECA: Failure Mode Effect and Criticality Analysis

FTA: Fault Tree Analysis

Chart 11 RCD (Result Cause Diagram) Method - Example of Abduction for a Past-Oriented Explanation of a Natural Mechanism

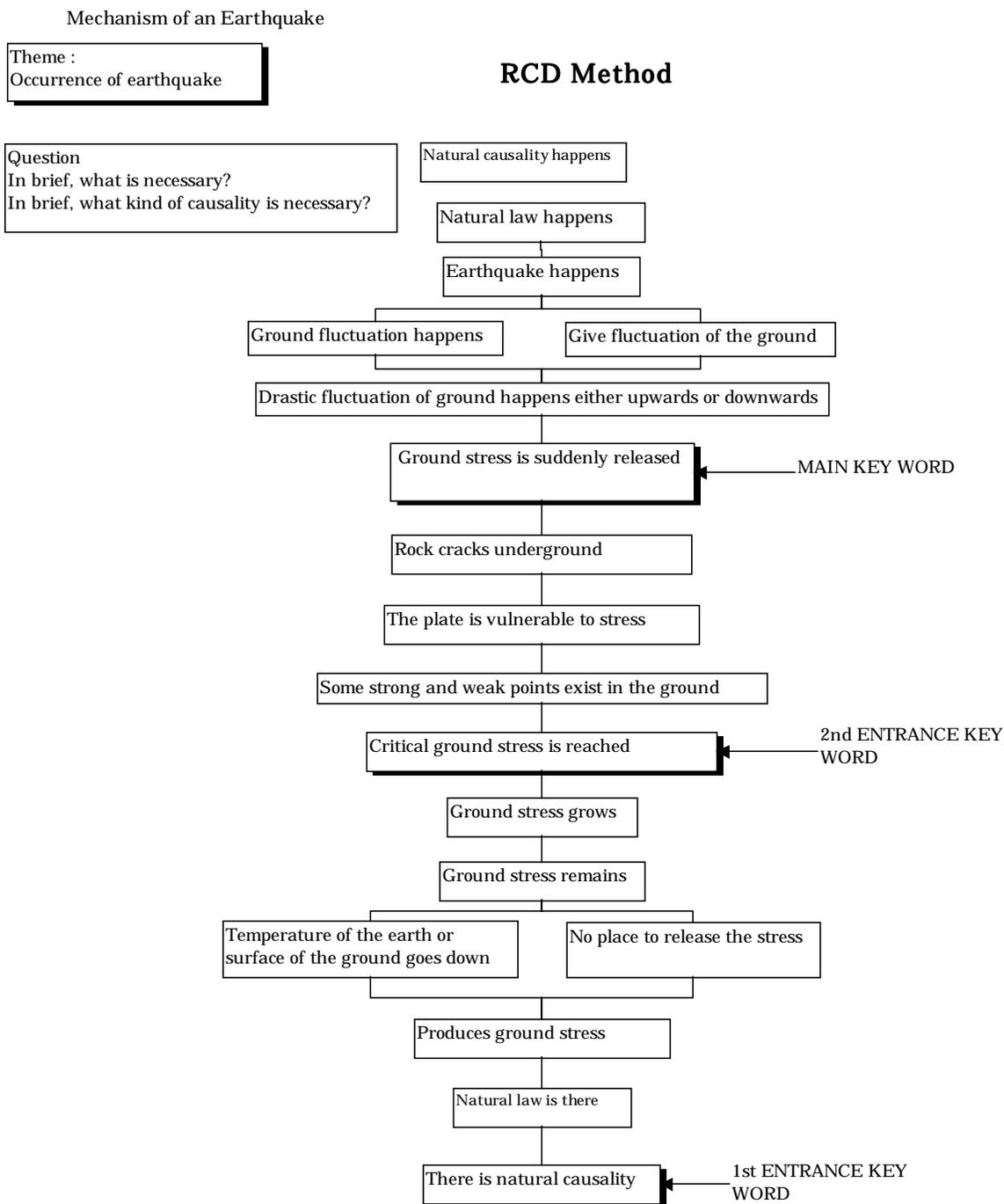


Chart 12 FRCD (Future Result Cause Diagram) Method -Example of Abduction for a Future-Oriented Forecast-Type of Natural Mechanism

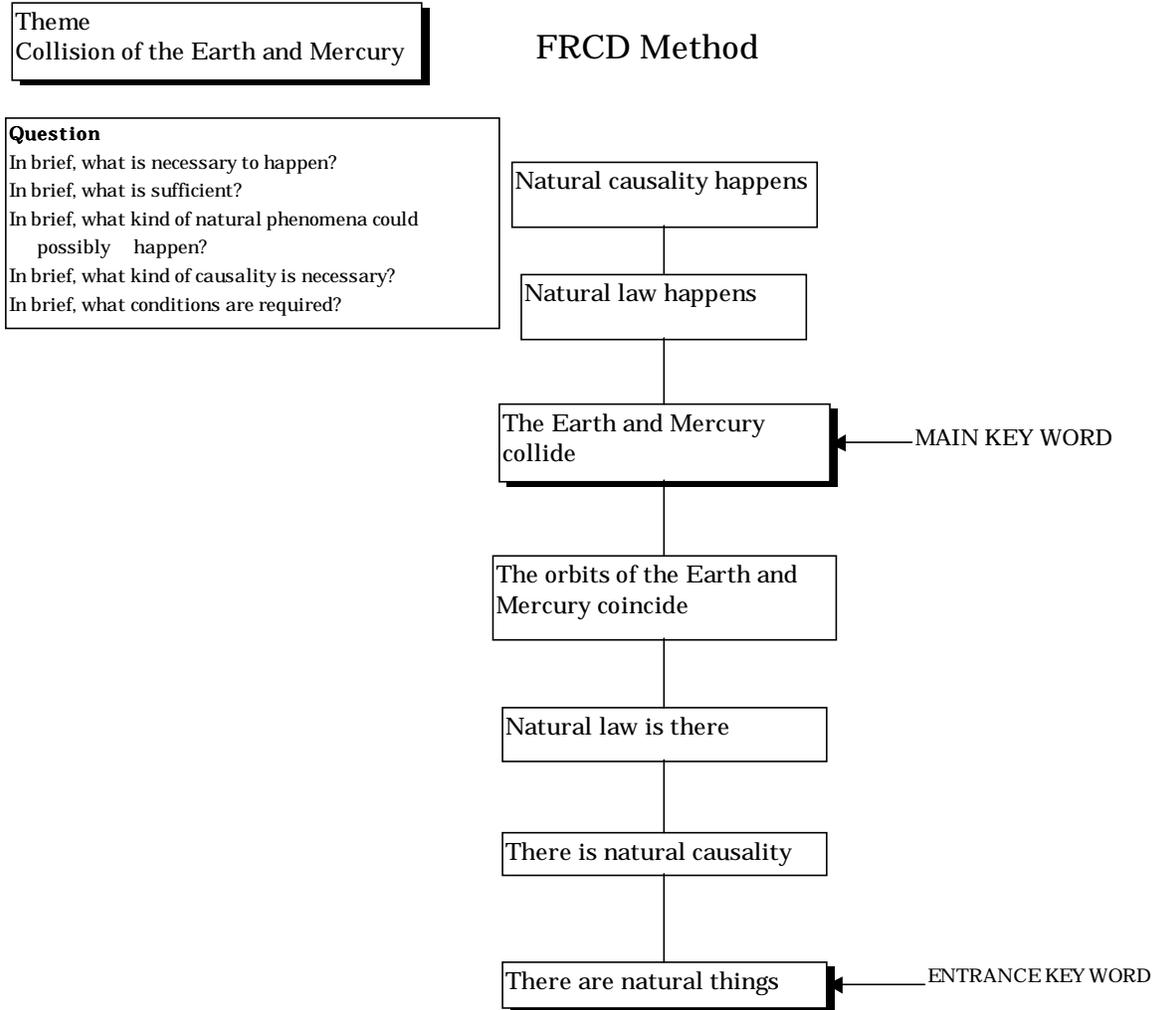


Chart 13 (1/5) General Clarification Chart of Abduction Preparation, Abduction, Verification, Evaluation, Decision-Making or Affirmation, Implementation, and Ex Post Facto Evaluation in Each Case

F-I Future Intended Mechanism Creation Type (PMD)

	Summarized expression	Method	Concrete example
Random information	—————	Collect and record daily information	Acknowledge estimate ranking based on a zero base information collection phase
Preparation abduction	What to do	Decide theme name using theme PMD method	Graduate as scheduled (Temporary theme)

Abduction	Hold expressions of “do”, “want to do”, “good to do” and “should do”	Grasp the main key word using a PMD (Purpose Measure Diagram)	In brief, complete graduation thesis
Verification	Show structure and causal relationships necessary to realize what you want to do (by doing something)	Implement first information collection, idea design, and structuring based on Steplist Method	Arrange total scale of the thesis through the structuring of the thesis based on abduction (agrees with theory)
Evaluation	Accept and evaluate whether they are realistic or useful, judging from multiple views of the above structured points	Implement second information collection based on Steplist Method	Accept the contents (draft) of thesis
Decision to fully implement	Decide on concrete implementation (GO-AHEAD) based on evaluation	Move to full implementation from second information collection based on Steplist Method	Decide when to start to write final thesis
Go	Proceed with the implementation, based on the above decision	Work on detailed items and actions based on Steplist Method	Completion and presentation of thesis. Graduation.
Post evaluation	Make use of result in society	Review and correct based on Steplist Method	<ul style="list-style-type: none"> • Use experience of the thesis (evaluate the value) • Feel satisfaction on completion of thesis

Chart 13 (2/5) General Clarification Chart of Abduction Preparation, Abduction, Verification, Evaluation, Decision-Making or Affirmation, Implementation, and *Ex Post Facto* Evaluation in Each Case

F-N Future-Nature Forecast-Type in Natural Mechanism Type (FCRD)

	Summarized expression	Method	Concrete example
Random information	_____	Collect and record daily and past information	Acknowledge estimate ranking based on zero base information collection phase
Preparation abduction	What happens	Decide the theme name using the theme CFRD Method	Destruction of the Earth (temporary theme)

Abduction	Think may happen	Grasp main key word and causality using FRCRD (Future Result and Cause Diagram)	The Earth and Mercury may collide
Verification	The structure and causal relationship of ...are and ... happens	Implement first information collection, idea design, structuring based on Steplist Method	This causality may result in collision (agrees with theory of causality)
Evaluation	Accept and evaluate that they are quite realistic, judging from multiple views of the above sequence of structuring and causality sequence	Implement second information collection based on Steplist Method	Evaluation test and simulation results show the above
Decision to fully implement	Decide on the concrete implementation of research on affirmed abduction	Move to "Full and concrete preventive implementation of GO-A-HEAD" from second information collection based on Steplist Method	Decide on research and action to fully observe Mercury in every possible causal relationship
Go	Implement based on above decision	Work on detailed items and actions based on Steplist Method	Research and observe (include the full observation or findings of computer simulation)
Post evaluation	Make use of result in society	Review and action based on Steplist Method	<ul style="list-style-type: none"> • Countermeasure to minimize causalities • Maximized usage of results of natural phenomena to defend the Earth

Chart 13 (3/5) General Clarification Chart of Abduction Preparation, Abduction, Verification, Evaluation, Decision-Making or Affirmation, Implementation, and *Ex Post Facto* Evaluation in Each Case

P-I Past-Oriented of an Artificial Mechanism (Intentional) Type (RCD)

	Summarized expression	Method	Concrete example
Random Information	_____	Collect and record daily and past information	Acknowledge estimate ranking based on zero base information collection phase
Preparation abduction	So what	Decide theme name	Aum Shinkyou (Religion) is questionable (Temporary theme)

Abduction	Think...must be	Grasp main key word and facts using RCD (Result and Cause Diagram) Method	Asahara must be the culprit
Verification	Certify abduction from multiple views and physical proof	Implement first information collection, idea design, and structuring based on Steplist Method	There are several facts based on abduction, i.e. only Asahara knows where the body was buried. (meets the theory)
Evaluation	Affirm abduction	Implement second information collection, based on Steplist Method	Asahara is the Devil based on verification
Decision to fully implement	Decide on countermeasures based on the affirmation of abduction	Move to full implementation of "GO-A-HEAD" phase from second information collection based on Steplist Method	Judgement: Asahara to receive death penalty
Go	Implement based on above decision	Work on detailed items and actions based on the Steplist Method	Execution of death penalty
Post evaluation	Make use of result in society	Review and preventive action based on Steplist Method	• Countermeasures to prevent future crimes The book: <i>Asahara, The Life of the Devil</i>

Chart 13 (4/5) General Clarification FigureFigure of Abduction Preparation, Decision-Making or Affirmation, Implementation, and *Ex Post Facto* Evaluation in Each Case

P-M Past-Oriented Explanation of an Artificial Mechanism (Accidental) Type RCD

	Summarized expression	Method	Concrete example
Random information	_____	Collect and record daily and past information	Acknowledge estimate ranking based on zero base information collection
Preparation abduction	So what	Decide theme name Arrange the theme using RCD (ResultCause Diagram) Method	China Airlines Crash (temporary theme)

Abduction	Think must have been	Grasp main key word and current facts using RCD (Result Cause Diagram) Method	FTA and FMECA design could not be processed well
Verification	Certify abduction by physical proof of multiple views and structuring or causal relationships	Implement first information collection, idea design, and structuring based on Steplist Method	There are structuring and causal relationships showing insufficient FTA/FMECA design and crashes (agrees with theory)
Evaluation	Accept abduction based on above elements	Implement second information collection based on Steplist Method	Evaluation tests and simulation results show the above
Decision to fully Implement	Decide on countermeasures based on affirmation of the abduction	Decide on full scale preventive action phase : GO-AHEAD stage from second information collection based on Steplist Method	Idea planning and decision of preventive action for future use using above causal relationship
Go	Implement based on decision that was made	Work on detailed items and actions based on Steplist Method	Arrange report and procedure on how to design without any mistakes
Post evaluation	Make use of result in society	Review and corrective action based on Steplist Method	Countermeasures to prevent future accidents

Chart 13 (5/5) General Clarification Chart of Abduction Preparation, Decision-Making or Affirmation, Implementation, and Ex Post Facto Evaluation in Each Case

P-N Past-Oriented Explanation of a Natural Mechanism (RCD)

	Summarized expression	Method	Concrete example
Random information	—————	Collect and record daily and past information	Acknowledge estimate ranking based on zero base information collection
Preparation abduction	So what are they	Decide theme name	Earthquake (temporary theme)

Abduction	Think that it .must be....	Grasp main key word and current facts RCD (Result Cause Diagram) Method	The ground must have been vulnerable to stress
Verification	There is causality like,are ..., ...are....happened, oris happening	Implement first information collection, possible structured idea, based on Steplist Method	There are structuring and causal relationships (agrees with theory)
Evaluation	Accept and evaluate that they are quite realistic based on the above elements	Implement second information collection based on Steplist Method	Evaluation tests and simulation results show the above
Decision to fully Implement	Affirm the above contents and decide future use based on affirmation of the abduction	Move to full usage stage from second information collection based on Steplist Method	Affirm the above and decide future use using above causal mechanism in natural phenomena
Go	Implement based on the above decision made	Work on the detailed items and action based on the Steplist Method	Using the above decision, arrange the report and procedure on the above relationship chart for each case of future usage
Post evaluation	Make use of result in society	Review and preventive action based on Steplist Method	<ul style="list-style-type: none"> • Countermeasure to minimize causalities • Maximization of results to prevent disaster using causal mechanism in natural phenomena

Chart 14 : Integrated flow diagram that illustrate the relationship of the process of the abduction, verification, evaluation, and decision-making

Chart 13 (3/5)
P-I Past Oriented of an Artificial Mechanism (Artificial) Type (BVD)

Summarized expression	Method	Concrete example
Random information	Collect and record daily information	Acknowledge estimate ranging based on a random information collection phase
Preparation abduction	What to do	Conducts an initial list (temporary thesis)
Abduction	Hold expressions of "if", "want to do", "good to do" and "should do"	In brief, complete graduation thesis
Verification	Show structure and content relationship necessary to realize what you want to do (by doing something)	Average total scale of the thesis through the structuring of the thesis based on abduction (spare with theory)
Evaluation	Verify and evaluate whether they are realistic or useful. Judging from multiple views of the above structured parts	Average the content (depth) of thesis
Decision to fully implement	Decide on various implementation (IQ-AHAT) based on evaluation	Decide when to start to write final thesis
Go	Proceed with the implementation based on the above decision	Completion and presentation of thesis Graduation
Post evaluation	Make use of result in society	2.111 Use experience of the thesis final use (the value) 2.121 Post verification on completion of thesis

Chart 13 (2/5)

P-N Future/Nature Forecast Type in Natural Mechanism Type (ICRD)

Summarized expression	Method	Concrete example
Random information	Collect and record daily information	Acknowledge estimate ranging based on random information collection phase
Preparation abduction	What to do	Conducts an initial list (temporary thesis)
Abduction	Hold expressions of "if", "want to do", "good to do" and "should do"	In brief, complete graduation thesis
Verification	Show structure and content relationship necessary to realize what you want to do (by doing something)	Average total scale of the thesis through the structuring of the thesis based on abduction (spare with theory)
Evaluation	Verify and evaluate whether they are realistic or useful. Judging from multiple views of the above structured parts	Average the content (depth) of thesis
Decision to fully implement	Decide on various implementation (IQ-AHAT) based on evaluation	Decide when to start to write final thesis
Go	Proceed with the implementation based on the above decision	Completion and presentation of thesis Graduation
Post evaluation	Make use of result in society	2.111 Use experience of the thesis final use (the value) 2.121 Post verification on completion of thesis

Finally, this positions how abduction, verification, evaluation, and decision-making are used to create a future-oriented mechanism.

Chart 13 (4/5)

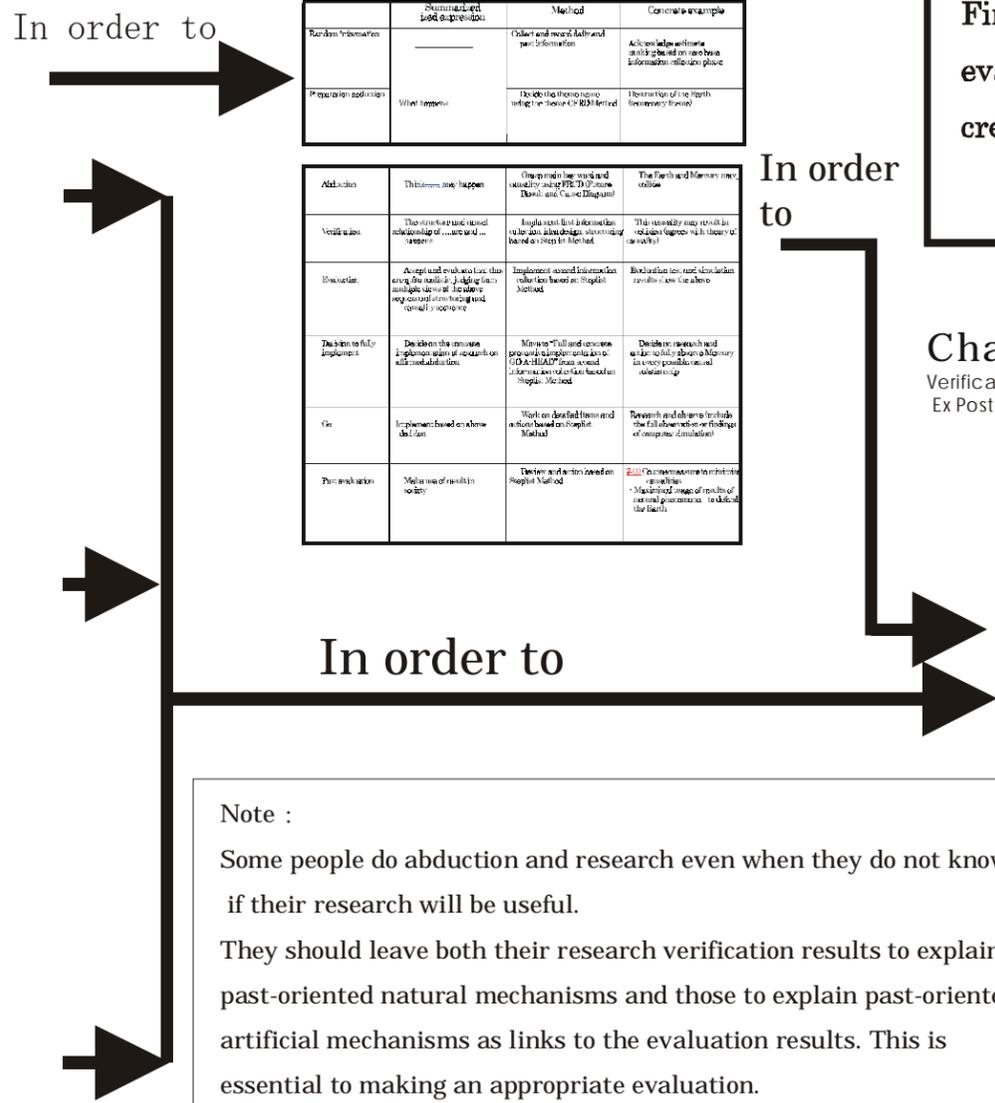
P-M Past Oriented Explanation of an Artificial Mechanism (Artificial) Type (BVD)

Summarized expression	Method	Concrete example
Random information	Collect and record daily information	Acknowledge estimate ranging based on a random information collection phase
Preparation abduction	What to do	Conducts an initial list (temporary thesis)
Abduction	Hold expressions of "if", "want to do", "good to do" and "should do"	In brief, complete graduation thesis
Verification	Show structure and content relationship necessary to realize what you want to do (by doing something)	Average total scale of the thesis through the structuring of the thesis based on abduction (spare with theory)
Evaluation	Verify and evaluate whether they are realistic or useful. Judging from multiple views of the above structured parts	Average the content (depth) of thesis
Decision to fully implement	Decide on various implementation (IQ-AHAT) based on evaluation	Decide when to start to write final thesis
Go	Proceed with the implementation based on the above decision	Completion and presentation of thesis Graduation
Post evaluation	Make use of result in society	2.111 Use experience of the thesis final use (the value) 2.121 Post verification on completion of thesis

Chart 13 (1/5) General Clarification Chart of Abduction Preparation, Abduction, Verification, Evaluation, Decision-Making or Affirmation, Implementation, and Ex Post Facto Evaluation in Each Case F-I Future Intended Mechanism Creation Type (PMD)

F-I Future Intended Mechanism Creation Type (PMD)

Summarized expression	Method	Concrete example
Random information	Collect and record daily information	Acknowledge estimate ranging based on a random information collection phase
Preparation abduction	What to do	Conducts an initial list (temporary thesis)
Abduction	Hold expressions of "if", "want to do", "good to do" and "should do"	In brief, complete graduation thesis
Verification	Show structure and content relationship necessary to realize what you want to do (by doing something)	Average total scale of the thesis through the structuring of the thesis based on abduction (spare with theory)
Evaluation	Verify and evaluate whether they are realistic or useful. Judging from multiple views of the above structured parts	Average the content (depth) of thesis
Decision to fully implement	Decide on various implementation (IQ-AHAT) based on evaluation	Decide when to start to write final thesis
Go	Proceed with the implementation based on the above decision	Completion and presentation of thesis Graduation
Post evaluation	Make use of result in society	2.111 Use experience of the thesis final use (the value) 2.121 Post verification on completion of thesis



Note :
Some people do abduction and research even when they do not know if their research will be useful.
They should leave both their research verification results to explain past-oriented natural mechanisms and those to explain past-oriented artificial mechanisms as links to the evaluation results. This is essential to making an appropriate evaluation.
To realize this, they should prepare the keyword or PMD-style thesaurus for future use.

Chart 13 (5/5)

Chart 13 (5/5) General Clarification Chart of Abduction Preparation, Decision Making or Affirmation, Implementation, and Ex Post Facto Evaluation in Each Case F-I Future Intended Mechanism Creation Type (PMD)

Summarized expression	Method	Concrete example
Random information	Collect and record daily information	Acknowledge estimate ranging based on a random information collection phase
Preparation abduction	What to do	Conducts an initial list (temporary thesis)
Abduction	Hold expressions of "if", "want to do", "good to do" and "should do"	In brief, complete graduation thesis
Verification	Show structure and content relationship necessary to realize what you want to do (by doing something)	Average total scale of the thesis through the structuring of the thesis based on abduction (spare with theory)
Evaluation	Verify and evaluate whether they are realistic or useful. Judging from multiple views of the above structured parts	Average the content (depth) of thesis
Decision to fully implement	Decide on various implementation (IQ-AHAT) based on evaluation	Decide when to start to write final thesis
Go	Proceed with the implementation based on the above decision	Completion and presentation of thesis Graduation
Post evaluation	Make use of result in society	2.111 Use experience of the thesis final use (the value) 2.121 Post verification on completion of thesis

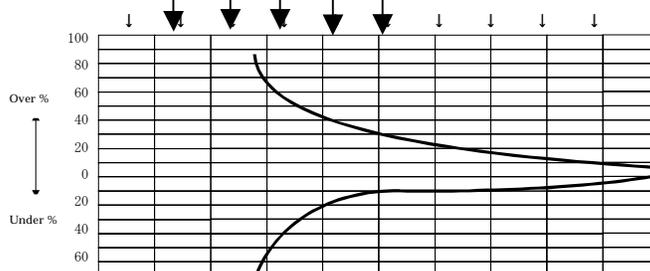
Chart 15: Actual development sample explaining the main processes of abduction, verification, evaluation and decision-making (Creation of a desk for easy-study)

Broad basic processes of abduction, verification, evaluation and decision-making		Operational step of PMD and corresponding Steplist	Operational contents of actual samples by PMD and Steplist	Narrow sub-processes	Narrow bases thinking of abduction, verification, evaluation and decision-making, and contents of operation
Abduction	Make PMD	(Theme) PMD Provide a desk which is wide enough to spread reference books and etc, and is high enough		Abduction	Arrange PMD
				Verification	Arrange PMD and verify whether we can structure the knowledge
				Evaluation	Obtain the main key word and entrance key word, evaluate whether key words are appropriate for society or those evaluating the PMD in term of their relationship to the purpose and measure.
				Decision-making	Decide whether to move to the next step of key word realization
Inductive approach	Verification	The first information collection Basic idea Structuring	<p>Show the basic idea and structure that we would accept and agree with to achieve the goal (This is the future evaluation)</p>	Abduction	Collect various useful tentative ideas to realize the main key word (Usually, three comparative ideas are recommended for comparison)
				Verification	Write them down on paper and verify whether they are possible to realize judging from the view points of technique and cost
				Evaluation	Pick up the characteristics, compare the three ideas and evaluate them
				Decision-making	Check that all material is ready for evaluation meeting and decide on the attendance to the meeting. Decide temporarily that the 3 proposed comparative ideas are just enough to make a comparison and positive evaluation (This means that a positive evaluation will create the additional value)
	Evaluation	The second information collection	<p>Compare and evaluate comparative each of the above ideas on the basis of cost, weight, ease of use, and disposal cost</p>	Abduction	
				Verification	Verify ideas to achieve the goal from multiple points of view. (If there is only 1 idea, think about whether it really is the only idea)
				Evaluation	Compare and add value from various views (If something is lacking or needs to be supplemented, add the requirement or ideas and improve the value of the basic idea)
				Decision-making	Evaluate whether everything is ready for decision-making
Materialization	Decision-making	Stage transfer from the second information collection phase to the base item (This means "Full-Scale GO-A-HEAD")	Top personnel of the team make the final decision based on a comprehensive evaluation (Issue the order sheet of the decision to implement the idea)	Abduction	Explain the evaluation result=decision(draft) to concerned people
				Verification	Extract the condition and comments on the decision (draft) from the people concerned and adjust to get the result
				Evaluation	Get acceptance and acknowledgement of the decision(draft) from all people
				Decision-making	Top personnel make the final decision to implement (Issue the order sheet, draw the design and arrange)

Chart 16: Grade of Estimate chart

(Use this chart as a thinking grade chart or the fussy ranking grade chart, if necessary)

Process of abduction, verification, evaluation and decision making	PMD and Deductive stage in Step of Steplist	Operational contents	10-stage of grade of estimate class										
			Corresponding estimate classes to Before abduction, Abduction, Verification, Evaluation and Decision					Implementation Stage after Abduction, Verification, Evaluation and Decision					
			9	8	7	6	5	4	3	2	1	0	
Random information abduction preparation	Collect zero base information, and design a temporary theme	Decide on the theme	○	○	○	○	○	○	○	○	○	○	○
Abduction	Design PMD	Obtain the key word		○	○	○	○	○	○	○	○	○	○
Verification	First information collection	Collect information			○	○	○	○	○	○	○	○	○
	Idea	Idea											
	Structuring	Structuring				○	○	○	○	○	○	○	○
Evaluation	second information collection	Evaluate materials for decision-making						○	○	○	○	○	○
Decision-making	Stage transfer from second information collection to basic items	Decision-making							○	○	○	○	○



Note 1:
Use the figures in this chart only for guidance because the numbers have been obtained from a certain type of statistics or experienced trend.

Note 2:
This material uses a part of the *Manufacturing Planning Estimating Handbook* by Frank W. Wilson (Copyright 1963) of the American Society of Tool and Manufacturing Engineering, with the permission of McGraw-Hill Book Co. This Figure has been enlarged with some additions.

[Citation] :
Michihiko Esaki, *Advanced Project Management (The Method of DTCN/DTC)*, AACII Press, 1997 in Japanese, Figure 6.2-3. The estimate grade ranking Figure is quoted with some additions.

Chart 17 : PMD (Purpose Measure Diagram) which positions the meaning and content of evaluation and evaluation standard with the use of DTCN/DTC

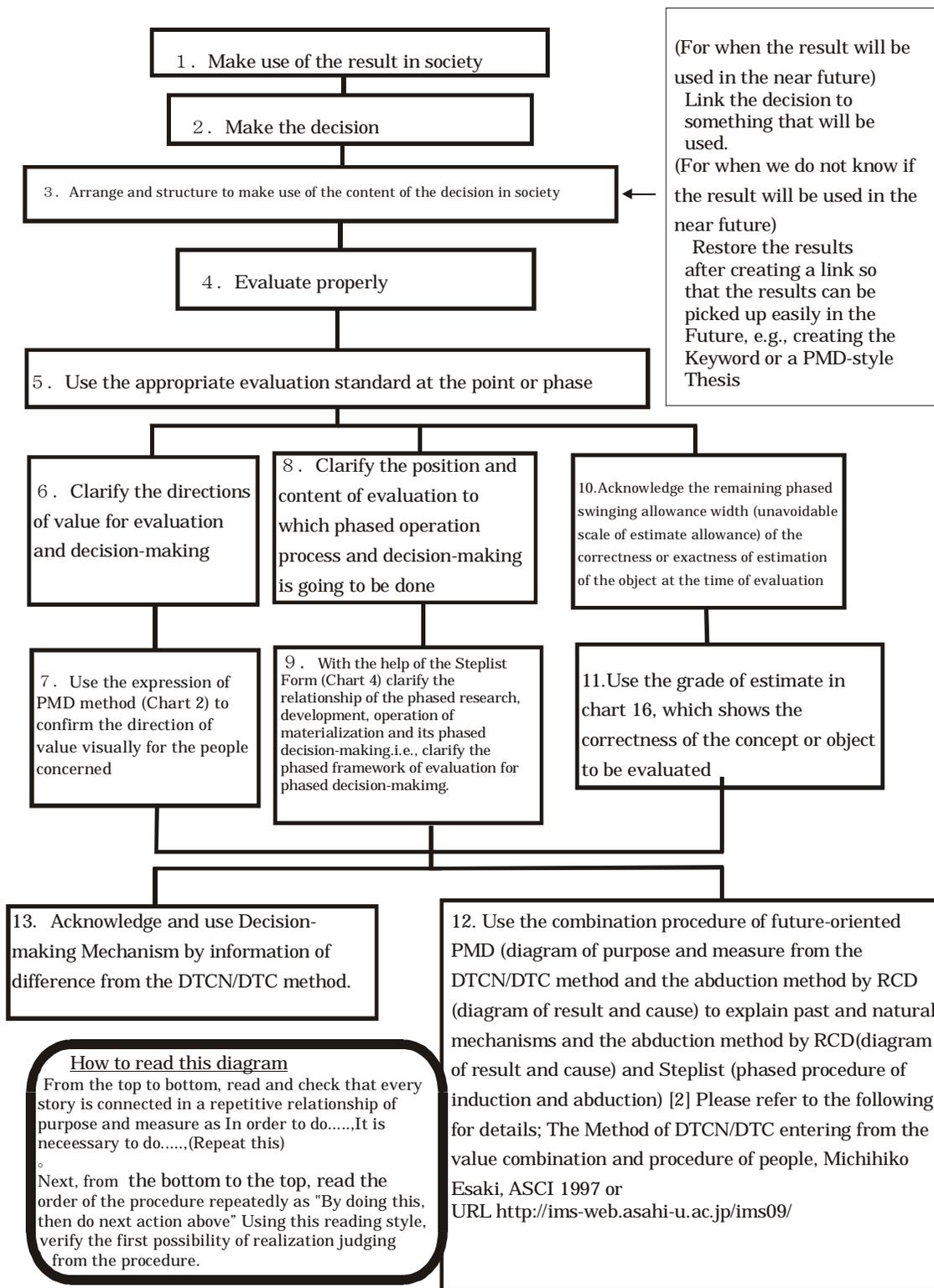


Chart 18: The direction in which we nod or shake our head

Discovered by Michihiko Esaki in 1986

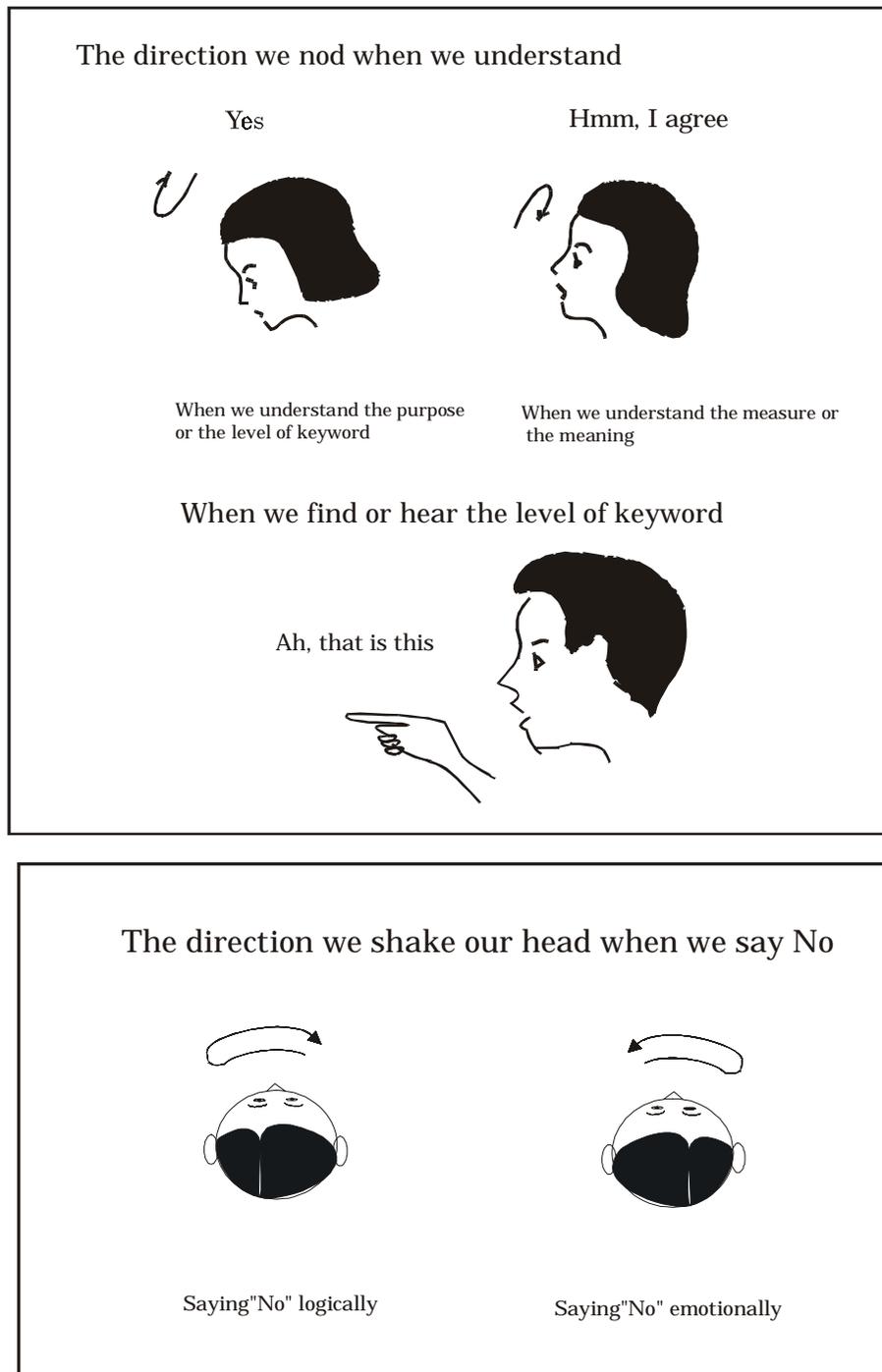
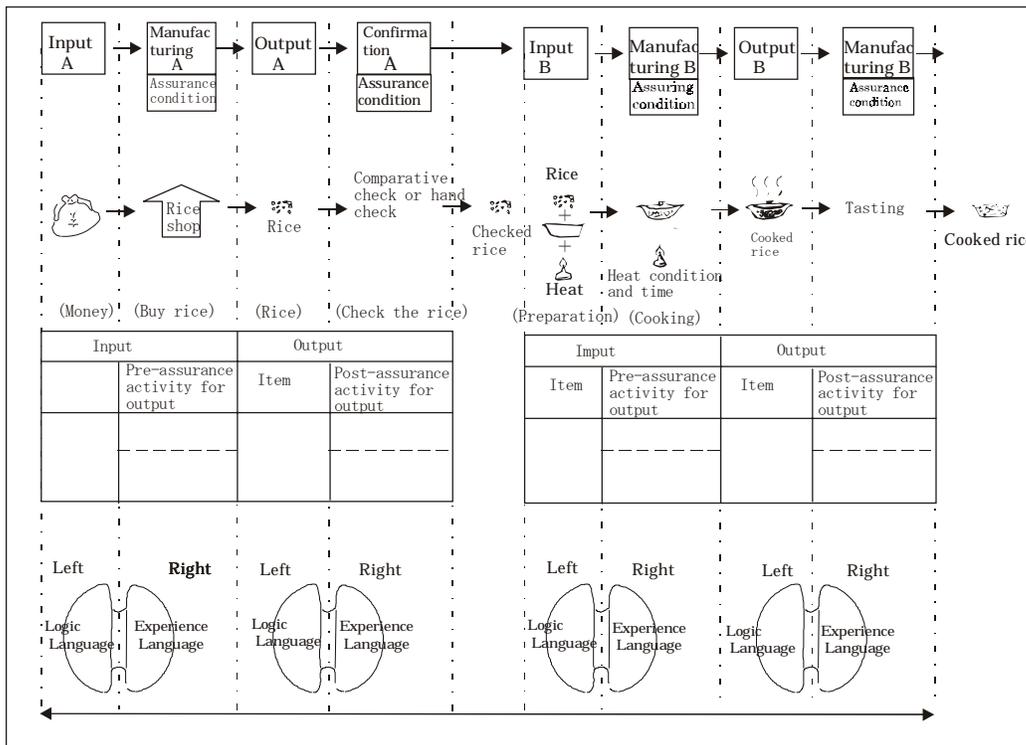


Chart 19: The relationship between the creation of procedure and image, and the left and right brain

Relative comparison of the four forms of "input item, pre-assurance activity, output item, and post-assurance activity" in the Steplists which create the phased procedure, by using the left and right brain's ability.

From this, we understand the conversation between the left and right brain and how to make use their role of functional reponsibility without any mistakes.



The process of issue, keyword, comparative idea creation, selection of ideas in the FBS diagram to create the image structure of the object and a functional comparison of the left and right brain

It can be understood that obtaining the keyword (Summarized abduction expression) is the character expression to switch from the left brain to right brain (image brain).

