Chapter 1

Prologue (A Way Of Thinking And Recognition)

Abstract

In this chapter, we review the following to provide an overview of the whole book

- 1. The birth of the methodology and its background
- 2. The structure of the book
- 3. The decision-making mechanism using information of difference, which we use subconsciously
- 4. The proper use of questions for creative thinking and decision-making

Chapter 1

Prologue (A Way of Thinking and Recognition)

1.1 Introduction

- 1.1.1 The birth of the methodology and its background
- 1.1.2 The purpose of the methodology
- 1.1.3 The scope of the methodology
- 1.1.4 The structure of the book

1.2 Decision-making mechanism using information of difference

- 1.2.1 Introduction
- 1.2.2 Decision-making in a very simple example
- 1.2.3 How to create a Purpose-Measure Diagram which shows the direction of value for decision-making
- 1.2.4 Necessary conditions for making decisions in management
- 1.2.5 Persuasive forecast
- 1.2.6 A method for easily identifying the information of difference
- 1.2.7 Card-making for comparing information
- 1.2.8 Purpose-Measure Diagram for the maintenance of standard man-hours
- 1.2.9 Summary

1.3 The Proper use of questions for creative thinking and decision-making

- 1.3.1 Understanding the difference between "In order to do what?" "How to do?" and "Why?"
- 1.3.2 Proper use of "In order to do what?" "How to do?" and "Why?" questions
- 1.3.3 Use of the question "Why?"
- 1.3.4 The "Because" theory
- 1.3.5 The effect and evaluation of the methodology
- 1.4 Way of Thinking and Policy of DTCN/DTC

1.1 Introduction

- 1.1.1 The birth of the methodology and its background
- 1.1.2 The purpose of the methodology
- 1.1.3 The scope of the methodology
- 1.1.4 The structure of the book

1.1.1 The birth of the methodology and its background

The following problems/tasks remain in the existing field of scientific management methods.

(1) Many engineering methods such as VE (Value Engineering), IE (Industrial Engineering), QC (Quality Control), and QA (Quality Assurance) have been developed to increase the effectiveness of management. These are effective in their respective areas, but if there were a way to unify them, it would be very convenient. Isn't there a way of integrating, supplementing, and appropriately joining all of these methods together?

(2) The NM-method, invented by Masakazu Nakayama, and the KJ method, invented by Jiro Kawakita, are excellent for producing ideas and understanding phenomena, but when it comes to links with concrete business such as R&D, there is a gap. Isn't there a way of appropriately joining together and supplementing all of these methods?

(3) Existing project management is supposed to start from the GANTT chart and WBS (Work Breakdown Structure), but there is no established procedure to work out a faultless phased procedure or WBS for a new task before the GANTT chart.

Isn't there a good way of creating such a procedure? (See Figs. 1.1-1 and 1.1-2.)

(4) To perform R&D for new products, to create customers, or to improve performance, cost, and reliability in industry and government, people have called for a generalization of Quality Assurance (QA) and quality control (QC). This applies also to the upper stream of development where QA and QC must be woven into the conceptual phase. Isn't there such a generalized QA and QC?

(5) To achieve a concrete target cost or performance, an operation must be appropriately divided into phases. How could these phases be set up to proceed with a faultless rational operation and its accompanying decision-making? (This is the need for a way of thinking and procedures for Design to Cost)

(6) A manager has to generate consensus and motivation among the people concerned. Can't a procedure be worked out to achieve this from the viewpoint of scientific and engineering methodologies?

(7) Confusion remains concerning scientific and engineering methodologies. Isn't there a way to

appropriately divide and combine them?

This book answers these questions.

1.1.2 The purpose of the methodology

1.1.2.a The concept behind the name of the methodology

The author gave the name "Thinking and its procedure for design to customers' needs" (DTCN methodology) to the methodology in this book. The name was thought up for the following purposes:

(1) To create new values through individual or collective thinking

(2) To materialize a balanced combination of the development of science and technology with regards to software and hardware, and the development of the underlying economy (cost considerations)

(3) To meet the first two objectives, proceed with "Thinking and its procedures for design to cost" (DTC methodology) which combines cost considerations with DTCN methodology

(4) This thinking and these procedures make explicit what is implicit in our way of thinking creatively. Hence we may use this methodology as a tool to creatively and systematically draw out the wisdom and action of people, and obtain the satisfaction of the individual and the whole through the process of materialization.

(5) Making explicit what was implicit in our way of thinking creatively as in (4) will point toward a new age in the formation of creative decision-making mechanisms and forge new creative sensibilities.

1.1.2.b The meaning of the term "Design To Customers' Needs"

The expression "Design To Customers' Needs" (DTCN) was coined together with Design To Cost developed in the United States during the 1970s. "Design To Customers' Needs" is an imperative, and signals a policy. The policy has the following meaning and effect.

(1) When making decisions- for the customer, one must determine who the customer is; then this becomes the basis of all thinking and action. As a result, systematic decision-making and action will occur.

(2) Also, every decision made must be made for the customer, so there is no room for poor decision-making (ill-natured and unhealthy decision-making or black-hearted decision-making).

(3) The purpose of DTCN is creating customers nd satisfying those customers' needs.(The customer may include oneself)a

(4) On the other hand, the supreme goal of an enterprise, which can be set without running into an

impasse, and the goal of a profit-making enterprise are related as follows:

According to P. F. Drucker and others [1], the supreme goal of an enterprise without impasse is to create customers and satisfy those customers' needs. To realize this uppermost goal, the enterprise must maintain service, and develop the next product or system to satisfy the next customers' needs. In order to develop the next product or system to satisfy the next customers' needs, the enterprise must survive. To survive, the enterprise must get a minimum amount of profit. This is the goal of enterprise profit-making.

For the government, read taxes instead of profit.

[1] P. F. Drucker : Management , Tasks , Responsibilities Practices . Hyper & Row, 1974

1.1.2.c The thinking and procedures of DTCN (DTCN methodology)

This thinking and procedures consist of analyzing our everyday thinking and action which yield good results, and procedurizing and mapping them on paper. As a result, the process becomes visible and open to application. Rational and creative thought and action, which were impossible with existing methodologies, therefore quickly become possible for individuals and groups.

Hence, if the consensus to use DTCN methodology is once established among the people concerned, it can be effectively used for drawing up plans, and considering, deciding and following up on them within the physical limits of space and time.

This thinking and these procedures basically consist of the following:

(1) Thinking and recognition

- The way of thinking expressed by the term "Design To Customers' Needs"
- Recognizing the decision-making mechanism using information of difference
- Method for aligning the vectors of creative thinking and action, i.e., the proper use of the questions "In order to do what?" "How to do?" and "Why?"
- (2) DTCN methodology procedure

(Note: This procedure is necessary only when a problem crops up.)

PMD (Purpose Method Diagram) method (alias: method of Key Word)

Employing this procedure:

A. Create the correct relation between purpose and measure which can be shared with customers (especially when starting something which has no precedent).

B. Identify the exact expression of the objective result (Main Key Word).

Note: "objective" here means both "intended" and "non-subjective."

C. Align the vectors of decision-making towards the objective result.

D. Clarify where to begin (Entrance Key) to realize the objective result (Main Key)

The method of steplist management

Create a step by step faultless procedure to realize the objective result.

FBS (Function Breakdown Structure) technique

Make an optimal image structure of the objective result to be realized.

WBS theme phasing technique

Themes and ideas to realize the objective result are collected from the people concerned, and discussed phase-wise in a timely manner.

5-3 phase improvement method

The improvement approach patterns, from the present situation, to be improved or the developed result is divided into 3 or 5 phases. As a result, balanced improvement and development are made possible. The steplist management method is one of these approach patterns.

Root Organizing (RO) Method

The grass-roots groundwork is laid to realize new things in the organization.

The implementation plan document and carrying it out

Using the above methods, the chief of an organization orders the implementation plan document to be made, approves it, and follows it up.

Brief explanations of the above are given in Fig. 1.1-1, 1.1-2, 1.1-3.

1.1.2d A Way Of Thinking And Procedure For Design To Cost (DTC) Using DTCN Methodology

When the policy "design according to target cost" must be implemented, it can be added to DTCN methodology.

The methodology has already been officially applied to the development of the medium training JET plane XT-4 by the Japanese Defense Agency and the H– rocket by the National Space Development Agency of Japan, and was successful in preventing soaring development costs, and in achieving the target production cost and performance.

If the way of thinking and the procedure for Design to Cost (DTC) using DTCN methodology is employed, it is easy to balance cost with performance, scheduling, reliability, etc. Hence, the DTC method can be used as an effective management tool for various projects and programs. The results are already apparent in various projects. (It is assumed that the factor weighing method has already been introduced.) 1.1.2e The background of the birth of "A Way of Thinking and Procedure for Design to Cost"

We explained the background of this method in 1.1.1. In particular, in (5) we said that to achieve a concrete target cost or performance, the operation must be divided into phases, and asked how these phases could be set to achieve a faultless rational operation and its accompanying decision-making. (This is the basis of the need for the way of thinking and procedures of Design to Cost.)

Historically, this need was also present in the United States at the beginning of the 1970s.

The author published, through the Sanno-Daigaku Publishing, Co., "A New Way of Thinking and Procedure for Design to Cost" to meet this need in December 1984. This further developed into "A Way of Thinking and Procedure for Design To Customers' Needs" (DTCN methodology). For purposes of exposition, we shall regard the DTC method to be DTCN methodology with the condition "design according to target cost."

We shall now explain the background of the DTC method as it was during the late 1970s.

(1). What is Design to Cost?

Design to Cost is a term expressing management by objective in design, planning, and execution. Here, design, planning, and execution can cover anything from an individual's life to national enterprises (regardless of whether software or hardware).

(2) Social needs for Design to Cost

Cost control for complex products such as defense systems was very difficult, and large price increases relative to ordinary industrial products became conspicuous during the 1960s. As a policy starting from the design phase, the concept of Design To Cost was born. The same need applied to complex products in the private sector and non-military enterprises of the government.

(3) The beginning of Design To Cost

Design To Cost began as follows:

- In 1971, the US Department of Defense (DoD) directive 5000.1: Acquisition of major defense systems: Design To Cost Requirements was issued.
- In 1973, Joint Army, Navy, and Air Force: Joint Design To Cost Guide: Life Cycle Cost as a Design Parameter was issued.
- In 1975, DoD Directive 5000.28: Design To Cost was issued.

These were the announced policies and way of thinking for Design to Cost. However they expressed only a basic concept; practical procedures on how to proceed with design work, for example, remained

undeveloped.

(4) The necessity of procedures for Design to Cost

Proposition:

Show only the total target cost for a complex system, proceed with the design, and create the product at the target cost.

(What is necessary then?)

↓

Measure (how to proceed):

It is necessary to have a route to follow and an idea of how to start and proceed.

(What is necessary then?)

 \downarrow

It is absolutely necessary to have procedures.

Design To Cost is a proposition given as a policy, and implementation procedures are necessary to materialize it at the operation site. In concrete terms, the procedure refers to an operation sheet or document, and includes tools or formats.

(5). The Situation regarding Design To Cost (1970 -75)

DoD Directive 5000.28 Design To Cost (1975) (policy)
↓
DTC management policy (concept) procedure?
↑
VE method (as one measure) was useful but not adequate.

Problems and what was necessary to solve them

For defense systems, the DoD Directory could be referred to. However, in Design to Cost situations such as for the private sector, major systems for other countries, or other large-scale projects, this was not practical.

Also, as noted previously, even for defense-related products, practical procedures for the Design to Cost remained undeveloped. This was the situation in 1975.

One method, VE (Value Engineering), was of help to proceed with DTC, but it was inadequate for handling all procedures or creating an integrated way of thinking. Therefore, solutions to the problems listed below were sought all over the world.

(6) Problems with Existing DTC

. How and from where to start and to maintain compatibility with project management?

How to set and allocate target costs in a rational manner?

How to improve VE to make it easier to use for DTC?

WBS (by MIL-STD-881A) and function tree structures are quite similar, but what is their relationship?

How should the optimal WBS and function tree structure be created?

How to come up with images of ideas and select those to meet each objective after they have been identified?

How to effectively accumulate historical data on cost and performance for multiple uses? (Existing cost tables rapidly become obsolete.)

What process can be used to analyze the quantity effect regarding cost and the influence of price escalation?

How we can control the deviation in cost estimates as the design progresses?

How should the DTC method be adjusted between earlier and later design phases when a slightly different technique emerges?

Can the Life Cycle Cost technique be simplified?

How can we proceed with MIL-STD-499A (Engineering Management)?

Is an incentive (reward system) really necessary?

To answer these problems, "A New Way of Thinking and Procedure for Design to Cost" was created.

(7) How was "A New Way of Thinking and Procedure for Design to Cost" born?

The social needs for a practical DTC procedure were discussed in (5). They were met through the development of concrete and practical procedures in Japan (Figs. 1.1-4 and 1.1.5).

1.1.2f Applications of DTC by using DTCN methodology

DTC using DTCN methodology is applicable to the following:

(1) Design according to the unit production target cost in the development phase: DTC for Unit

02-Chap 1 R6

Production Cost

(2) Lower lifecycle cost in the whole development phase: DTC for Lifecycle Cost

(3) Design according to the target development cost in the development phase: DTC for Development Cost

1.1.3 Scope of the methodology

Existing and foreseen applications of DTCN methodology through its procedure creation capacity include the following:

(1) Method of project generation;

- (2) Method for market creation;
- (3) Initial method of system design;
- (4) Development methodology for large-scale systems;
- (5) Method for target design (including DTC);
- (6) Implementation method for program assurance;
- (7) Planning of integrated logistic support;
- (8) New ways to construct information systems/software, and the system algorithm itself;
- (9) Algorithm for artificial intelligence in the future;
- (10) Picking up themes or subjects for R&D and evaluating them;
- (11) As a basic tool to integrate many organizations in a joint operation;
- (12) Research in behavioral science;
- (13) Investigation of differences in the way men and women habitually think and act
- (14) Researching new methods of securing safety; and
- (15) Construction of CALS (Continuous Acquisition and Lifecycle Support)

Also, this way of thinking and procedure should be of use as a concrete development method discussed in [2] and as an algorithm to be included in software science and technology.

[2] The Science and Technology Council of Japan: Report on Consultation No. 19 "Basic R&D Plan for Software Science and Technology" December 2, 1992

1.1.4 The structure of the book

This book consists of the following 9 chapters, and Appendices A -F (See Fig. 1.1-6)

- 1. Prologue (Way of Thinking and Recognition)
- 2. Seven Basic Methods of DTCN
- 3. Examples of the Basic Method Applied and their Considerations
- 4. Supplementary Methods for DTCN Methodology
- 5. Reasonable Price and Decision Standard (Knowledge of Reasonable Price)
- 6. Basic Conditions to Proceed with Design to Cost
- 7. Design to Cost for Unit Production Cost
- 8. Design to Cost for Development Cost
- 9. Conclusion and Future Prospects

Appendices (A -F)

Also, each chapter consists of the following sections. We shall pick up the salient points following Fig. 1.1.6.

Chapter 1: Prologue (Way of Thinking and Recognition)

1.1.Introduction

We explain the birth of the methodology, its background, and its purpose and scope, and the structure of this book.

1.2 Decision mechanism using information of difference

We identify the decision mechanism using information of difference which we use subconsciously, and discuss its applications.

1.3 The proper use of questions for creative thinking and decision-making

We explain the proper use of "In order to do what?" "How to do?" and "Why" questions. We can then escape from the chaos of a welter of opinions generated by the repeated use of "Why?"

Chapter 2. Seven Basic Methods of DTCN

In this chapter, we explain the following 7 methods to realize the policy of DTC and DTCN, and how they were born. They are compatible, complementary, and integratable with existing methods in management technology.

2.1 The PMD Method

The PMD and theme/subject setting methods, which clarify the correct relation between purpose and measure, and from where and how to start.

2.2 Method of Steplist Management Method to create a faultless phased plan.

2.3 Method of 3-5 Phase Improvement

The appropriate division approach pattern for balanced development and improvement over the present state.

2.4 FBS Technique (FBS: Function Breakdown Structure)

Creating an image structure of the object is considered here, in contrast with the previous two sections, which deal with ways of thinking and procedures.

2.5 WBS Theme Phasing Technique (WBS: Work Breakdown Structure)

The method which gathers and considers themes/ideas from the people concerned to realize the objective.

2.6 Root Organizing (RO) Method Method to start new things within the organization.

2.7 Implementation Plan Document Method

Method for preparation and maintenance of the implementation plan document to realize the purpose of the organization by using DTCN methodology.

Also, in this chapter:

2.8 How DTCN methodology was created and the comparison of steplist procedures with other conventional procedures.

Chapter 3: Examples of the Basic Methods Applied and their Considerations

3.1 How to create the domain of thinking and the domain of consensus among the people concerned.

Concrete applications of the PMD method given in Chapter 2 are presented, and some considerations are stated. Also, a comparison is made between the PMD method and related methods such as the KJ method, as well as a brief comparison of linguistic backgrounds.

3.2 The details of steplist management and advanced considerations

Concrete applications of the steplist management given in Chapter 2 are presented.

Based on these applications, some considerations, including those related to large hierarchy development, are stated, and relations with other methods are discussed.

Chapter 4: Methods Supplementary to DTCN Methodology

In this chapter, we explain the methods which support DTCN and DTC. (The names in parentheses are the originators or organizers of the method). Also the NM method, originated and applied by Masakazu Nakayama, is very significant. It is therefore given, with the kind permission of the originator in Appendix A with some figures.

4.1 Re-defined WBS (Work Breakdown Structure) Method (MIL-STD-881A, Michihiko Esaki, Yukio Iwabuchi, Hiroshi Mizuta)

4.2 Joint use of WBS and PMD (WBS Moebius-style) (Michihiko Esaki, Tateaki Nagashima)

4.3 Evaluation and structuring method for pre-evaluation from a rational perspective (Fasal, Fujita, Klee, Esaki)

Chapter 5: Reasonable Price and Decision Standard

5.1 Steplist for reasonable price (Michihiko Esaki) The phases of how to decide a reasonable price are stated.

5.2 How to use the cost/price breakdown table for cost control (Michihiko Esaki)

5.3 Price decision standard (Association of Purchasing Management of Japan, Michihiko Esaki)

Chapter 6: Basic Conditions to Proceed with Design to Cost

In this chapter, we refer to Chapter 1: Prologue, Chapter 2: Basic Methods, and the Supplemental Methodologies of Chapters 5 and 6, and preview the minimum knowledge required to proceed with Design To Cost.

6.1 General matters

6.2 Minimum knowledge needed to proceed with DTC

6.3 Essential conditions to proceed with DTC

Chapter 7: Design To Cost for Unit Production Cost

In this chapter, we refer to all of the above, and show how to proceed with Design To Cost for Unit Production Cost.

- 7.1 General matters
- 7.2 Details of DTC phases
- 7.3 Comparative selection of purchase parts and its DTC procedure
- 7.4 Implementation of Design to Lifecycle Cost using information of difference
- 7.5 Organization and management of DTC
- 7.6 Significance of DTC for Unit Production Cost using DTCN methodology

Chapter 8: Design to Cost for Development Cost

In this chapter, we refer to the above DTC for Unit Production Cost, and show the essential procedures and their formats of Design To Cost for Development Cost by adopting a Q&A style

Chapter 9: Conclusion and Future Prospects

9.1 Conclusion

We offer a conclusion.

9.2 Future Prospects and Themes

We discuss future prospects and themes, and, in particular, propose how to proceed with "Bacsic R & D plan for sofyware Sceince and Technology" [2] using the DTCN methodology.

[2] Science and Technology Council of Japan: Policy on Consultation No. 19 "Basic R&D Plan for Software Science and Technology," December 12, 1991 In Appendices A – M, we further make the above technology applicable to the details of daily business and thinking by supplying the material below.

A. NM method: Method of Image Creation Thinking starting from Key Words (Masakazu Nakayama)

B. Supplemental detailed techniques and knowledge to proceed with DTCN/DTC Methodology at the operation site ("Genba")

C. MIL-STD-499A (Called the Bible of System Engineering)

D. The story of the first success in actual use of DTCN/DTC methodology

E. Samples of implementation plan documents and forms necessary to proceed with DTC/DTC Methodology

F. One-page explanation of DTCN/DTC Methodology

G. A Method for changing Knowledge to Wisdom and a Wisdom Engine for Wisdom Management Era.

H. A Procedure and Format for Thinking and Action of "Abduction, Verification, Evaluation and Decision-making" to reveal and Past Mechanism and to crate Future Mechanism .

I. The self organized flow chart to create and improve goods, product , service, market with multi-screen wisdom desk (combining QFD, TRIZ and TAGUCHI method. by DTCN/DTC method)

J. The relationship between QFD, VE/VA and DTCN/DTC Methodology

K. The method of Project Management/Accouting using Reversal Journal

Position Format (The method to Create Co-operative Tthinking and Working Place among Science / Engineering and Management/Accounting people)

M. Trainig by aPMD to create a PMD.

Supplement

The following ways of thinking and procedures consist of an original classification of casual daily creative thinking and decision-making, turning them into a concrete and visible procedure. Recently, a combination of these procedures has been used to observe our actions and recognition patterns, recognize hitherto unrecognized phenomena and formulate hypotheses about their underlying mechanisms. These are included, for illumination, as episodes in the text.

The hypotheses above mean to take up phenomena still unclear in medicine or other areas, imagine their mechanism, and provide an explanation of the phenomena. For reasons stated above, our exposition will begin with seemingly trivial matters, but we hope the reader will excuse us. <References>

- (1) DoD directive 5000.1: Acquisition of major defense system, 1971
- (2) DoD directive 5000.28: Design to Cost, 1975
- (3) Joint Army, Navy, Air Force, Joint Design To Cost Guide-Lifecycle Cost as a Design Parameter.
- (4) MIL-STD-499A: Engineering Management



Fig.1.1-1 Methodological wants in conventional project management methodology





Fig.1.1-3 The Purpose-measure diagram of DTCN thinking and procedure





Fig. 1.1-4 How DTCN and DTC thinking and procedure was born

6	i .					
Phase			1			
Year	Budgetal	Conceptual	Development	Manufacturing	Operation	Function of each method
		 	 	Frederic Taylor/Henry Ford	1	
1910	-	 	 	(1) IE		(1) 10 improve manufacturing method
1940	-	1 	Lawrence Miles		1 1 1	(2) To improve the existing
1950		 	(2) VA / VE		point of its basic
1330		 		1	1	function
	Rand	CO.		1	! 	(3) To allocate the budget
1960	(3) PPBS		U.S. NAVY			(1) To improve schedule
		,] !	(4) P	ERT cost		(4) to improve seneduce
		1 1 1	1 		- 	
1070	DOD directive 5000.1/5000.28				(5) To create the concept	
1970	-	(5) I	OTC(concept)	MIL-STD-499A	 	of objective in design
			1 		1	P
1080		(6) LCC	(concept)			(6) To expend the above to lifecycle
1500		Michihiko ESAF	A Official use in	Japan Defense Agency Deve	elopment	
1981	- (7)	XX/				(7) To change concepts
		way of thin	king and proc	edure for Designing	g 10 Cost	(5)(6) to procedure
	Michihiko ESAKI	I I I	1	1	 	
1988 (8) Way of thinking	ng and its pro	redure for Desi	gn To Customer's Ne	eds & DTC	(8) Same as above.
						Methodology can be
↑			 	Can be used	to transmit	hardware or software
	Can be used in the th creation stage	neme !		the project k next project	now how to	
		1	1			

Fig. 1.1-5 History of Methodology development in each phases of the lifecycle since Taylor's Method

Fig.1.1-6 The Structure of DTCN/DTC methodology (the number to the left of each item refers to the chapter no.)



1.2 Decision Mechanism using Information of Difference

1.2.1 Introduction

1.2.2 Decision-making in a simple example

1.2.3 How to create a Purpose-Measure Diagram, which shows the direction of value for decision-making

- 1.2.4 Necessary conditions for making decisions in management
- 1.2.5 Persuasive forecast
- 1.2.6 A method for easily identifying the information of difference
- 1.2.7 Card-making for comparing information
- 1.2.8 Purpose-Measure Diagram for the maintenance of standard man-hours
- 1.2.9 Summary

1.2.1 Introduction

1.2.1.a The purpose of this chapter

Rational management consists of achieving the desired objective by an optimal combination and use of available resources (people, material, money, time, technology, and information). In this operation, important aspects are rational decision-making and its associated judgment of action.

In this chapter, we explain the mechanism of decision-making we subconsciously use. To avoid misunderstandings, a very simple example is taken up. We describe a concrete method to fix onto paper the direction of value, a basic element of the mechanism. We further state the conditions for application to management, and an introduction to associated information collection techniques.

1.2.1.b Terminology in this section

- (1) The decision made: Contents of the decision to take action
- (2) Judgment of action: To judge whether an action is good or not.
- (3) Decision-Making: The process of making a decision
- (4) Direction of Value: Direction of value expressed by a Purpose-Measure Diagram

The relationship between action, decision and judgment: To take action, it is necessary to make a decision. To make a decision, it is necessary to judge.

1.2.2 Decision-making in a simple example

Suppose, as in Fig. 1.2-1, that we have two jelly doughnuts before our eyes which are exactly the same in appearance. We further assume that they are exactly the same distance from our hands. There would be hesitation for a moment over which one to choose. We may *imagine* that one has more jelly filling than the other, *differentiate* between the two, judging for action, and then pick up a jelly doughnut. This is the mechanism of simple decision-making. As seen from this example, we always seek an *appropriate information of difference* before action. In general, it is evident that no judgment of action can be arrived at if there is no difference or information of difference.

Another aspect is that choosing the jelly doughnut with more filling or less filling will depend on our sense of purpose and measure (called the direction of value of the actor). For example, as in Fig. 1.1-2, he/ she may eat lots of sweets *in order to* maintain his/her health, or refrain from eating sweets *in order to* maintain his/her health. We judge differences according to the sense (vector) of purpose and measure.

If we like filling and have no caloric problems, we would take the jelly doughnut imagined to have more filling. However, if we do have caloric problems, we would avoid that doughnut. We therefore see that besides information of difference, a purpose-measure axis is necessary. If we draw these relations, we obtain Fig. 1.2-3. Namely,

(1) Judgment of action requires collation between the direction of purpose and measure, and the vector of information of difference .

(2) For that, a vector of the purpose- measure relationship is necessary,

(3) and also the information of difference to be checked against it.

(4) To obtain the information of difference, a comparison is necessary,

(5) and the comparison requires setting up either two or more plans or a standard and a plan

(6) When judgment of action is completed, action, or the next thinking starts

(7) Whether or not to eat the jelly doughnuts also constitutes two comparative plans.

From the above, it becomes clear that in order to make an appropriate judgment of action,

it is necessary to have the information of difference by comparison. This is regardless of whether the *direction of information of difference* turns out to be positive or negative with respect to the *direction of value* of the actor.

However, we should note that even if this mechanism is clarified, there is a *tendency in government or among industry personnel to act based on an opportunistic information of difference, and an opportunistic direction of value* for themselves, instead of acting for the true customer of a firm or an office. There are strong demands to combat this tendency. In other words, unlike the simple case of jelly doughnuts, a systematic method becomes necessary in the world of management to avoid creating a fictitious *information of difference* or an easy-going purpose-measure relation which diverges from its original essence. (For example, one may omit a measure of investigation into an important problem because it is bothersome, or put one's own comfort before the needs of customers.)

Fig. 1.2-4 is a diagram rearranging the elements of Figs. 1.2-2 and 1.2-3 according to the relation of purpose and measure. If we read this figure from top to bottom only as a purpose-measure sequence "in order to do something, its is necessary to do something," it becomes even more evident that, for thinking or action or their commencement, the priorities are making the relation of purpose and measure (vector of the direction of value), and setting up either two or more plans, or one plan and a standard.

If we further generalize this diagram of purpose and measure, we arrive at Fig. 1.2-5. If we read this diagram from top to bottom, it becomes an expression of "a way of thinking" indicating the relation between purpose and measure. If we read from bottom to top, it expresses the relation between measure and result, i.e., a rough procedure. (The difference between a rough procedure and a faultless procedure will be explained in Chapter 2: Basic Methods of DTCN.)

1.2.3 How to create a Purpose-Measure Diagram, which shows the direction of value for decision-making (cf. Fig. 1.2-6)

When we talk, think, or act, we always have a subject or theme. Let us start from this subject or theme.

We assume that the subject or theme is given, or self-imposed. We know from experience that expressing the subject matter in a somewhat abstract or summarized form is often useful in arriving at a judgment of action. However, the procedure/technique of making this summary have remained unknown. Here we shall give it.

When people gather and feel that they have thoughts in common, it takes time to come up with a joint view as an abstract expression or Key Point. One example is when a meeting does not get into focus. In such a case, a compact and time-saving summary becomes available with the methods below.

We first present a paper (most of the original) by the author to create a Purpose-Method Diagram for the summary discussed above.

Steps for making a Purpose-Method Diagram

(1) A subject or theme, or task is presented. It may be given or self-imposed by the individual or group concerned.

(2) Ask two questions regarding the subject or theme: "In brief, what are we trying to do with it?" and "In brief, what should we at least do?" Write down answers on paper in the form "In brief, it's 'doing A to do B'," using nouns and verbs. A minimum number of adverbs and adjectives (words or phrases) may be added to these expressions.

(3) By association, write down further sentences: "doing A to do B" on paper until all possible expressions are exhausted.

(4) Cut the paper so that each expression is independent.

(5) Arrange the expressions so that "in order to do what" is upward and "how to do" is downward as in Fig. 1.2-6. In more detail:

First, take two expressions at random and place them on the table. Reading them aloud, determine which is better up and which is better down, according to the sequence "in order to

do what"-"how to do." Add another expression, and again determine the order according to your impression. Remember that what is placed upwards is the purpose and what is downwards is the measure. Repeat this operation, and arrange all expressions in a vertical form repeating "in order to do A, it is necessary to do B," "in order to do B, it is necessary to do C."

(6) If an expression appears which does not fit into the vertical form in any way, arrange it horizontally, and repeat the steps above.

(7) After finishing the arrangement, check, by reading aloud, whether any expressions are missing vertically or horizontally, and whether any should be rephrased, and make the necessary revisions and additions.

(8) Fix the final arrangement with transparent tape on a large sheet of paper. (Do not use adhesive tape as it changes with humidity.)

(9) Among the expressions, find one which is at the most appropriate level to include the meaning of its upper level expression and its lower level expressions for the subject. Strangely enough, this usually appears around the middle level. If such an expression cannot be found, create one. This is the focal expression for the subject, and we call it the Key Word for the subject.

If we actually prepare such a Key Word at the beginning or in the preliminary phase of a meeting, later operations become surprisingly smooth. This is the mechanism of smooth decision-making. We call the column of expressions the Purpose-Measure Diagram (PMD) in this methodology.

The order of the purpose and measure in the PMD is an expression of the direction of value of the people involved, and the method above draws this out onto paper. Once it is drawn out, the direction of value can be checked by outsiders, for example, for social benefits. Also this method is a mechanism for solving a problem previously mentioned, namely that people in charge in government and industry often act on the basis of opportunistic information of difference and opportunistic direction of value, rather than serving the customer. The above summarizes the way to clarify the relation between purpose and measure, and discover or identify the Key Word for the subject. The detailed method of using this mechanism is given in Section 2.1, "Application Examples of PMD Method," and in Chapter 3. We may also interpret the expression "view of value" as the collective directions of value for various themes and subjects (cf. Fig. 1.2-7).

1.2.4 Necessary conditions for making decisions in management

If we make a PMD (Purpose-Measure Diagram) for the subject "Essential conditions for making decisions in management," we arrive at Fig. 1.2-8. The Key Words in this PMD join the abstract expressions in the upper levels and the measure expressions in the lower levels, and are surrounded by thick lines. Hereafter, we take up these Key Words to grasp the necessary conditions for making decisions in management, starting from the blocks on the left of the figure.

Block No.1 shows the necessity of creating a block diagram to clarify "the direction of value" by the purpose-measure relationship as explained previously.

Blocks No.2 to No. 6 show the necessary items to produce the information of difference to be collated with the direction of value.

In more detail, No. 2 deals with creating two comparative plans to extract information of difference, and notes that the plans must be realizable.

No. 3 and No. 4 show the necessity of simultaneity and weight assignment to compare the above two plans at a common level.

For example, the same \$1000 is worth something different this year and next year because of interest. If the annual interest rate is 10%, \$1000 next year is actually \$910 with the interest deducted.

Weight assignment can also be understood in the example of marriage, where factors such as figure, intelligence, and health enter. The weighing of these factors differs from person to person, and assigning a weight means that each factor is multiplied by a weighting coefficient. If two candidates for marriage are present, each factor of the two is evaluated,

multiplied by the weighting coefficient, and the candidate with the greater sum is chosen as leading.

Block No. 5 shows that correct information must be obtained to make a comparison. Direct information through one's own senses, such as sight or touch, is accurate, but information from others is less so. Also the quality of information differs whether one gathers it on purpose or not. We also know from experience that gathering information is much more efficient when one has a purpose in mind.

For the next block, No. 6, "Persuasive forecast," we draw on the story by Han Fei Zi, "Three people make a tiger in the marketplace," to explain the mechanism whereby people believe in a particular piece of information.

In ancient China, there was a king of Wei. His servant Guang Gong came to him, and initiated a conversation. "If someone said that a tiger was out in the marketplace, would Your Majesty believe it?" "No, I wouldn't." "What if another person said so too, Your Majesty?" "I might." "If one more said so, Your Majesty?" "I would."

A similar thing can be said on the basis of statistics. We may note however that the story also warns us of being too easily swayed when making a judgment of action; that is, judgment also calls for independence.

Let us rephrase Han Fei Zi's story and bring it more in line with our previous analysis.

If there is only one piece of information about an object, its reliability is unclear. However, if two similar pieces of information are available, we can estimate the range from the mismatch of the two pieces. If there are three pieces, the width of error can also be estimated (Fig. 1.2-9).

If the three pieces of information complement each other, reliability increases. With four or more pieces, reliability increases further. If we can add direct information by sight or touch as a check, we can get maximum reliability.

Block No. 6 is about obtaining persuasive forecast information. In decision-making, an element of forecast enters, such as "what happens if we do this," or "A is likely to happen, so let's do B."

Therefore, persuasive forecast becomes necessary. This will be explained in more detail in the next subsection.

To summarize this subsection, the necessary conditions for a rational and speedy judgment of action in management are the following:

- To achieve the purpose of management, make block diagrams of purpose and measure.
- To make judgment of action easy, acquire or prepare the factors given in blocks No. 2 to No. 6.

Hereafter, we shall call the conditions laid out in blocks No. 1 to No. 6 as the Six Conditions of Decision-Making for Action.

1.2.5 Persuasive Forecast

We briefly mentioned in the previous subsection that a persuasive forecast was necessary in judgment of action or decision-making. The detailed considerations are as follows:

First, if we consider what the forecast or the forecast value (hereafter both called the forecast value for simplicity) is worth, we realize it must basically serve as a standard for judgment of action or decision-making arising in management. Whether the forecast value is correct can be determined only if the actual value can be obtained. This means that when the forecast value is used in judgment of action, it is unknown whether the value is correct.

It follows that when we use the forecast value in judgment of action, we use it as a standard only by assuming that it is probable. Since it is unknown whether the forecast value is correct or not, we are merely using it as a standard supplemented with previous experience or knowledge, or with how the value was arrived at.

For example, let us consider the oil crisis of 1973, a major event towards the end of that year. If we suppose somebody predicted there would be an oil crisis in November at the beginning of the year, it is unlikely that the prediction would have affected anyone's judgment of action. Only if there was an element of persuasiveness in the explanation of the prediction, would people have taken action. We see that forecast values, regardless of whether they turn out to be correct, are adopted on the basis of persuasiveness. Others which lack persuasiveness are of little worth. This is Persuasive Forecast.

Let us now the briefly discuss the methods for making a persuasive forecast. One way is to use the mechanism of "Three people make a tiger in the marketplace" as explained in the previous subsection. Another is to divide the value into an absolute part (A), a part that can be estimated by changing its premise (B), and noise (C), and then provide an explanation for each part (cf. Fig. 1.2-10).

An important consideration for people working in industry or government who need to use forecast values, is one's position if the value turns out to be wrong. A government official, for example, may use the values in the Government Economic Forecast for the Upcoming Year adopted by the Cabinet and announced at the beginning of the year. (Note: The fiscal year of the Japanese government starts from April.)

The principle in the use of forecast values is thus to use authoritative values, or use values which allow one to fall on the safe side if the values turn out to be wrong. The central technique remains to take previous experience, and assign weights or combine them. The previous subdivision into A, B, and C parts is applicable as a check (Fig. 1.2-10).

It should be emphasized that one of the uses of persuasive forecast values is to supplement a sensitive purpose-measure relationship, thereby allowing a more accurate judgment of action. One application is as follows:

In general, the sales amount of a firm can be depicted as a right rising curve with time as the horizontal axis. The standard for the appropriate curvature is the following:

First, if a logarithmic scale is used for the vertical axis, the curve is, in general, almost straight for an average firm. We then plot the GNP in a similar manner. The two lines run roughly parallel. By looking at the parallel and diverging components of the sales with respect to the GNP, we may ascertain whether the growth of the firm is real or apparent. The parallel component is the A part, and the degree of divergence the B and C parts. This is thus an example of one method of making persuasive forecasts, i.e., division into A, B, and C parts.

1.2.6 A Method for easily identifying the information of difference

The above is the theory for the information of difference, the starting point for judgment of action. We now give a few examples of how to obtain the information of difference easily.

(1) Comparison of similar objects using photographs (the one-eyed method).

This method makes a comparison by taking a joint photograph of objects with similar functions from the angle where their functions are most manifest. When the photograph is ready, the information to be compared, e.g., performance or cost, is entered directly on it with a felt-tip pen. If we do this, we can easily comprehend the information of difference.

The principle behind this mechanism can be explained by two examples. First, look at your forefingers with both eyes open, and compare them, e.g., the difference in their size and shape. Next do this with one eye closed. The difference shows up more sharply. This is called the one-eyed method.

A camera has only one lens, and hence it is one-eyed. This is the basis for comparison using a photograph. The reason that extra information is directly filled in lies in the principle of information of difference plus alpha. If key information is united, both become easier to understand. An example of this is comics. Words appear directly alongside pictures, and quick understanding is possible. If we explain the principle of comics in terms of the brain, we can say comics work on both the left brain, which deals with words, and the right brain which deals with images, simultaneously, and that is the knack of making things readily understandable. This is the method of comparison using photographs.

(2) Improvement of visibility (Fig. 1.2-11)

We sometimes read newspapers and books, clip out articles or copy important pages, and file them. This makes us feel that we understand the matter better. This is because the file allows us to gather and bring together similar materials, making for easy comparison (Fig. 1.2-12).

Increasing the visibility of management material to make judgments for action easily means that we should utilize principles which allow the easy understanding of information of difference. In other words, we should compare objects at the same level (or on the same plane), and create arrangements and standards which allow for easy comparison, the source of information of difference.

If we look at firms or institutions where the need for improved visibility in management is understood, they list out or draw the information on sizable boards. If fixed boards are insufficient, mobile boards can be used to make comparison easier. This principle should become important as computer screens become denser, bigger, and multi-windowed.

1.2.7 Card-making for comparing information

This method is an old one, but let us reconfirm its principles (Fig. 1.2-13). If one piece of information is recorded on each card, it is easy to rearrange or newly combine them, and extract the information of difference or the purpose-measure relation. This becomes the basis for various judgments for action or decision-making.

In the case above, pair-wise comparison is basic. This is because it is easy for people to compare two cards, but difficult to compare three cards, simultaneously. With two cards, the number of differences is one, but if one card is added, the number of differences jumps to three. If there is no information of difference between two cards, the information is identical or totally unrelated.

Another example is that pages are easier to understand when they are one-sided than when they are double-sided.

The Purpose-Measure Diagram "In order to do what?" and "How to do?" relationship, which turns up frequently in this book, also starts from comparing two cards, and positioning them. If the mechanism above is understood, other card-making methods such as the KJ method by Jiro Kawakita can also be changed and used effectively.

1.2.8. Purpose-Method Diagram for the maintenance of standard man-hours

Fig. 1.2-14 shows the Purpose-Method Diagram for the maintenance of standard man-hours. This diagram makes use of the A, B, and C portions and the information of difference. The Key Word level is the important starting point to compare rational man-hours and actual man-hours.

1.2.9 Summary

Above, we clarified the mechanism of simple daily judgments of action and decision-making. It is a very simple explanation, but the author is unaware of any other clear exposition. We shall describe the process by which the author arrived at this mechanism and explanation, and use it as a summary as well for a future reference.

(1) First he had the question about decision-making, "How is it done?"

(2) While this question was on his mind, he was involved in R&D management. The goal there was to eliminate as much waste as possible, so one had to clarify the relation between input and output. This led to a prototype of the steplist management given in Chapter 2.

(3) Then came the fact that, to go from one phase to the next in a steplist, a decision is required.

(4) How should one make that transition?

(5) There was the phenomenon that superiors have an easier time making decisions if two plans were submitted to them.

(6) This led to the repetition "Why two plans?" "Why two plans?"

(7) The question "What do two plans mean?" was also repeated. This question opened up a horizon.

(8) Then came the realization that the two plans must be capable of being adopted or realized, and therefore impossible ones do not count.

(9) "Two plans means a comparison." "To compare means to evaluate the difference." "As proof, when we compare prices, we compute the difference."

(10) But then "What does difference mean?" Around that time he was somewhat overweight, so he was told "Don't eat sweets."

(11) Oh, it's the difference between "To remain healthy, don't eat sweets" and "To remain healthy, eat sweets." Thus the purpose-measure relationship and the information of difference were connected.

(12) Sometimes looking at a photograph makes understanding easier than looking at the real thing. The question "Why does it happen?" was also on the author's mind. The principle was found by thinking "A camera is one-eyed." "Let me close an eye." "It's just like looking at a

photograph." "Compare your forefingers using just one eye."

(13) The difference is more apparent with one eye than two. This observation developed into the method of comparison using photographs.

(14) Another observation concerned making cards to do something. During the process, it was noted that when the cards were arranged according to the purpose-measure relation, the key point became easier to grasp and the key expression often came in the middle. The hint for this was Ref. [1], which said that when doing something, the key expression is easier to find if the ladder of abstraction is organized according to "Why?" and "How to?"

(15) The subject then became how to make this easier for Japanese, and it was realized that one should switch over to "In order to do what?" and "How to do?"

(16) Taking the three lines of development stated above, the mechanism of decision-making based on the information of difference became apparent.

(17) The paper quoted in this chapter was written, and the material up to Item 1.2.7 was summarized in 1973.

(18) The term decision-making should apply to the whole process: Prepare two plans, create value, evaluate (= raise the value) to make the final decision or judgment.

Let us look at the above again. In the explanation, the question "Why?" is not used except when referring to proven matters. The paper in the next section, 1.3, will explain the proper use of "In order to do what?" "How to do?" and "Why?" It was written 11 years after Ref. [2], which was a development and clarification of the above, and also served as the basis of this chapter.

<References>

[1] Warren J. Ridge: Value Analysis for Better Management (1969) American Management Association, Inc.

[2] M. Esaki: A Method of Decision-Making for Management (1973) Proceedings of all Japan Management Association Conference (Zenkoku-Noritsu-Daigaku of Japan) in Tokyo.

Fig.1.2-1 Two jelly doughnuts, identical apperance



Fig.1.2-2 The relationship between purpose and measure





Fig.1.2-3 Flowchart of decision making process (JELLY DOUGHNUT THEORY)

Fig.1.2-4 Purpose-measure diagram re-arranged from flow chart of decision making process



Fig.1.2-5 The procedure of thinking



Fig 1.2-6 The layout of a Purpose-Measure Diagam on a large sheet of paper



Fix the arranged cards with transparent tape

The knack of fixing the cards by tape is to fix the cards at time after releasing the static electricity by smoothing by hand or chin.

It is recommended to use cards without adhesive because it is easier to move them around on the paper.

Fig 1.2-7 View of value: Looking at the PMD of many themes or subjects



Theme : To manage In order to Try to avoid waste in order to obtain the required result 1975.11.21.M.E Try to have people concerned judge/act in the same direction with mutual How to Try to take action based on acceptable reality and the predicted information Try to take step-by-step judgement/aqction(decision making) Obtain information of difference which becomes the starting point for judgement/action and the direction of essence to collate with the difference of information Have the directions of the people concerned Obtain the information of difference show the same direction Clarify the standard of direction to be Obtain or create subject for comparison compared and plan subject to be compared and plans Clarify the subject and measures (in order to indicate the direction of Arrange so that comparison judgement to collate the direction can be made on the same level of information) No. 1 No.3 No.4 No.5 No.6 No Prepare block diagram which cralify Secure the Weigh the Obtain correct Obtain or Make or compariso the order of the Purpose-Measure simultaneity information to create create plans to compare compare and positions the plane of behavier of comparisor elemets persuasive forecast" (Subtitle/Keyword) Establish a rule and organization in order to collect basic data or information which becomes the subject of comparison Establish a rule and organization in order to combine elements for judgement/action(decision making) Use the idea of Purpose-Mesure Diagram here

Fig 1.2-8 Essential conditions for making decisions in management

Purpose-measure diagram shows six required conditions for decision-making in management

Fig 1.2-9 The information for pursuasive forecast



Fig.1.2-10 Forecasting value can be divided into portions, A, B and C



Fig.1.2-11 Economic forecasting by government for upcoming year

Dec.10	Forecast by economic planning agecy
Dec.28	Understood by Cabinet council
Feb.20	Decided by Cabinet council

Note: The financial year of the Japanese government starts from April









Purpose



Measure



Purpose-Measure Diagram

Fig.1.2-14 Purpose Measure Diagram "Why the maintenance of man hours is necessary?"



Note:

- *1. Cost driving factor means the element of conditional cost which changes when the conditions: are changed.
- *2. Divide man hours into three portions, A, B and C:
 - A portion is the one which is never changed; B portion varies by changing the conditions(e.g. press forming and/or hand forming); C portion is noise.
- *3. Therefore, cost control can be made only by concentrating the information of difference regarding B portion.

1.3 Proper Use of Questioning for Creative Thinking and Decision-Making Effective Use of the Questions "In order to do what?", "How to do?" and "Why"

1.3.1 Understanding the difference between "In order to do what?" "How to do?" and "Why?" questions

1.3.2 Proper use of the questions "In order to do what?" "How to do?" and "Why?"

1.3.3 Use of the question "Why?"

- 1.3.4 The "because" theory
- 1.3.5 The effect evaluation of the methodology

1.3.1 Understanding the difference between the questions "In order to do what?" "How to do?" and "Why?" (Fig. 1.3-1)

(1) The question "Why?" goes back to past matters or existing knowledge

(2) The questions "In order to do what?" and "How to do?" draw out thinking about the future

(3) One cannot begin thinking for new tasks, if the question "Why?" is used.

In the following, we show how to create the vectors of creative thinking and action by combining and properly using the above questions.

1.3.2 Proper use of the questions "In order to do what?" "How to do?" and "Why?"

We consider how correct knowledge is obtained.

1.3.2.a Recognition of cases

We divide acquisition of correct knowledge into cases of the past and the future.

(1) We designate "acquisition of knowledge by the proper purpose-measure relation" as "acquisition of correct knowledge about the future," and

(2) designate "acquisition of knowledge by the proper cause and effect relation" as "acquisition of correct knowledge about the past."

(3) To acquire knowledge about the proper purpose-measure relation of future matters, one should start from the questions "In order to do what?" and "How to do?"

(4) To acquire knowledge about the correct causal relation of past matters, one should start

from the questions "How did that happen?" or "How come it's like that?"

For example, suppose a child asks the question "Why can goldfish live in water?" In this case, the answer tends to be at the responder's whim. At times, the parent may say "That is God's will," a dead end for the child. However, if we switch the question to "How can goldfish live in water?" we may come up with hypotheses such as "Could it be because there is air in water?" Verifying the hypothesis by looking in books or by experiment, one then finds that they are using their gills to breath air, and arrives at the causal relation "Goldfish can live in water because they can breathe the air dissolved in water through their gills."

1.3.2.b Once correct knowledge is obtained, one may start from "Why?" for an intelligible explanation. Even in this case, however, one may also explain from "In order to do what?" "How to do?" or "How did it happen?"

1.3.2.c Image diagram of the above relation

We may explain the above relation using the present (point B) as a base in the image diagram (Fig. 1.3-1).

(1) The first equations "In order to what?", and "How did it happen?" both point from left to right.

(2) If we mix the questions "In order to do what?" and "Why?" one question points to the right and the other to the left, resulting in confusion.

(3) By starting from questions in the same direction as in (1), vectors of thought can be aligned to obtain an orderly conceptual system.

1.3.3 Proper use of "Why?" questin

1.3.3.a A case study of the question "Why"

If the question "Why?" is asked first, one is led to the following cases. However, except for cases (3) and (5), there is no guarantee which case one will be led to.

(1) Repeating "Why?" the correct algorithm is established, and one arrives at the correct answer.

(2) When the correct algorithm is not established, one may arrive at a false answer, which at face value provides the correct explanation.

(3) It is possible to aim for the situation above.

(4) In the worst cases, it will lead to responsibility issues, or hurting people's feelings.

(5) The past may be negated. Here, however, a paradox develops. The past cannot be erased, but one negates it and come up with an algorithm which treats the past as if it has disappeared.

(6) Thinking about the future that was done in the past may be revived and utilized. However, in this case, one repeats "Why?" to arrive at point C, and taking time, worrying, or negating the past, one finally arrives at point A, jumping over point D, recognizing one's thinking in the past.

1.3.3.b Effective uses of the "Why?" question

Use of the "Why?" question is advisable in the following situations:

(1) After the proper purpose-measure relationship, or the correct cause and effect relationship is established, "Why?" may be used for an intelligible explanation.

(2) If one starts to question "Why?" out of habit and is lucky enough, one can arrive at an understanding of the correct relationship. On the other hand, if one inserts tentative knowledge (such as religious matters), one can maneuver to arrive at an opportunistic conclusion.

(3) "Why?" can be used to convince ourselves of our own situation.

(4) The "Why?" question points to an unalterable past, so it is very effective for embarrassing people or pursuing their responsibility, not allowing any escape. If you wish to embarrass people, start with a "Why?" question by all means.

(5) The "Why?" question can be used to find the cause of the breakdown of existing mechanisms. This is because personal considerations need not enter. Even then however, it may be better to start off with "How did this happen?".

(6) Generally speaking, one may use the "Why?" question to become convinced of impersonal matters, or the mechanism of Nature through established hypotheses or theories.

1.3.4 The "because" theory

In bureaucracies or organizations, new things often cannot be initiated just with the knowledge of "In order to do what?", "How to do?" This is because governments and organizations have regulations which require an answer to "Why?" questions; for example,

accounting and budgetary laws. To deal with the situation, we insert the "because" theory in the above conceptual system. That is, after the correct relationships are established, one can answer "why" questions with "because". This allows explanations of policy, securing the budget, and social benefits.

Examples of "because" theory are:

- "Because a safe new-generation helicopter was developed to raise the efficiency of emergency rescue, saving many lives is possible.
- "Because there are requests from all quarters, which cannot be ignored, we should do A to do B"
- "Because they are doing it overseas, we should do A to do B".
- "Because a new purpose-measure relation is established, we should do A to do B" which allows action in government.

This method (way of thinking and procedure), which allows this conceptual system to be immediately applicable to daily business, is the PMD method described in the beginning of Chapter 2.

1.3.5 The effect evaluation of the methodology

1.3.5.a How this method was developed

This method was developed under the following circumstances.

- At an organization involved in large scale R&D, the development of an ideal large-scale integrated information system was planned.
- However, the agent responsible for the design of the integrated information system did not lay adequate groundwork, the long-term plan was unapproved, and it was attempted to place existing business on the computer system without any changes. This led to haziness about the relation with the whole project, business became more complicated and confusion reigned in the organization.
- The people in charge of the information system were pestered with the question "Why this mess?" from other members in the organization, with good intentions of finding an entrance to the solution, but with "Why?" "Why?" this automatically led to a pursuit of responsibility.

• To escape this situation, the method was developed.

1.3.5.b How the mechanism in the method was utilized

- This method recommends using "Why" to intentionally embarrass people.
- However, that was not called for. The author distributed copies of the method and PMD thinking in Chapter 3, and gave OJT (On the Job Training) for PMD to the people concerned.
- The situation changed. "Why?" questions petered out.
- This led to an improvement in the situation, and a long-term plan was officially set up using the 5-3 improvement method given in Chapter 2.

1.3.5.c Changes in the times

- People in organizations want to improve things, so they ask "Why?" with good intentions.
- At times, this may go well, but more often than not, it leads to confusion.
- The latter may happen particularly during the development of new things.
- Asking "Why?" was all right in the age of improving existing things, catching up with foreign technology, and materializing things whose model was already present.
- If a system was already in place, and trouble occurred in the system, one could start from "Why?"
- In contrast, when things such as new computers systems are developed and used for the development of things with a new concept, starting from "Why?" will almost always lead to a deadlock. A good example is the early phase of the development of the integrated information system described above.

1.3.5d Supplement

In Japanese, there is the question "doushite", which simultaneously means "Why?" and "How?" The nuance is closer to "Why", and "How?" rather than "How", and "Why?" 'Why?" comes first in its interpretation.

Therefore, let us reconfirm the simple rule: "Why?" and "doushite" should not be used until the correct algorithm is discovered. Only "How to do?" is permitted.

References

[1] M. Esaki, A Method to Create the Vectors of Creative Thought and Action, Proceedings of the Japan Creativity Society, Tokyo (Oct. 1989)



Fig 1.3-1 Image map of thinking pattern starting from "why" and "in order to, how to" questions

Fig 1.3-2 The section of our brain corresponding to Fig 1.3-1



1.4 Way of Thinking and Policy of DTCN/DTC

The way of thinking and policy of Design to Customers' Needs (DTCN) and Design to Cost (DTC) in this book.

Design to Customers' Needs is an imperative "design to meet customers' needs."

(1) When saying design for the customer, one must determine who the customer is, and that yields a basis for all subsequent thinking and action. Hence, systematic decision-making and action result based on knowledge of the customer.

(2) Every decision made must be for the customer, so there is no room for ill-natured and unhealthy decision-making or black-hearted decision-making.

(3) The purpose of DTCN is "creating customers" and "satisfying the customers' needs." (The customers may include oneself.)

(4) On the other hand, "the supreme goal of an enterprise which can be set without running into an impasse" and the "goal of the enterprise making profit" are related as follows: (A slight modification of P. F. Drucker).

- A. The uppermost goal of an enterprise without impasse is to create customers and satisfy their needs.
- B. To realize this uppermost goal, the enterprise must maintain service, and develop the next product or systems to satisfy the next customers' needs.
- C. In order to develop the next product or systems to satisfy the next customers' needs, the enterprise must survive. In order to survive, it is necessary to get a minimum amount of profit. This is the goal of enterprise profit making.
- D. In order to earn a minimum amount of profit, the enterprise must provide competitive information and products/systems effectively, efficiently, and at minimal cost. To this end, the information and products/systems must be developed at target cost. This is the policy of Design to Cost (DTC).
- E. For government, read taxes instead of profit.