

# Chapter 9

## Conclusions and Future Perspectives

### Abstract

The purpose of this chapter is to describe, in relation to the following two points, the concept of the DTCN/DTC method, how to draw out answers by utilizing this method, and future perspectives for the method.

1. Present answers to the "Needs for This Method and Their Background" mentioned in Prologue 1.1 in Chapter 1.
2. Present responses to a report concerning Proposal No. 19, "Basic Research Plan for Software-Related Technology" of the Science and Technology Committee of the Japanese Government (Dec. 12, 1992).

## **Chapter 9**

### **Conclusions and Future Perspectives**

#### **9.1 Conclusions**

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## **9.1 Conclusions**

### **9.1.1 Significance of this Publication**

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#### **9.1.4 Practical Outcomes**

#### **9.1.5 Further Applications of the Methods Found in this Publication**

### **9.1.1 Significance of this Publication**

(1) The main themes of this publication, entitled "Advanced Project Management Methodology" are presenting a new method that allows one to start R&D projects by creating the view of value among the people concerned; describing procedures to set cost targets; and designing projects by applying the new method.

The first new method is Design to Customers' Needs (DTCN), and the second is Design to Cost (DTC).

### **9.1.2 Answers to Challenges that Revealed the Need for this Publication**

At the beginning of this publication, several factors that made it necessary to develop these new methods and a description of their background were given.

The following is a list of these factors and how they were dealt with:

- (1) **Among the existing techniques developed to increase management efficiency are engineering methods such as VE (Value Engineering), IE (Industrial Engineering), QC (Quality Control) and Project Management. These should be universally applicable, but in some cases, there is a gap.**

**Isn't there a way of supplementing and appropriately joining all these methods together?**

[Answer (1)]

DTCN and DTC methods allocate the existing methods, and supplement, connect, and arrange them in the relationship of "in order to do A, it is necessary to do B."

The following are examples of how DTCN and DTC can individually supplement the VE, IE, and QC

methods as well as combine all these methods.

At a practical level, the link between these methods will be even deeper.

### 1) The IE Method

The IE method developed as a method to improve operation and production procedures.

The purpose of this method is to properly understand problems, and apply the methods necessary to solve them. However, as to how one can come to properly understand or grasp a problem, conventional textbooks on the IE method only state

"observe the situation at the site 'gemba'" or "understand the problems properly with the ultimate goal in mind."

Precise ideas or procedures as to how to narrow down the angles from which the problems are to be properly understood are almost neglected in textbooks on IE [1-3].

To determine these ideas and procedures, the decision mechanism by "information of differences," which is described in Chapter 1, and the PMD method explained in Chapter 2 can be applied. In addition, if the PMD method and the 3-5 Phase Improvement method are applied, the problems and their levels would be understood within a structure that is three-dimensional and withstands dynamic transitions. The actions taken to solve the problems would be connected by the PMD method and be comprehensive supplements to the IE method.

### 2) The VE Method

The VE method begins with the question: "What is it?" Its purpose is to reform plans and create new measures, attaching importance to the basic functions that can be understood by asking this question. However, textbooks on the VE method only give a vague definition of the functions that are fundamental to the method, saying "the functions, among the functions a subject in question is performing or should be performing, without which the *raison d'être* of the subject will be lost," or "the functions situated at the top within the assumed scope of the function diagram." Conventional textbooks on the VE method fail to clarify precise or positive procedures, or methods to understand and determine the basic functions [4].

The PMD method resolves this problem (see section 2.1.4 of Chapter 2).

The VE method prohibits the use of adjectives and adverbs in describing basic functions. However, this leads to a problem. For instance, if the basic function of a pen is "to mark tentatively," the ideas and

measures drawn from it would be very different from those when the basic function of a pen is "to mark permanently." This problem can be solved with the FBS technique. However, the VE Method is very effective in understanding the problem by a very simplified function.

Conventional textbooks on the VE method do not clarify the relationship between function diagrams and the Work Breakdown Structure (WBS), as is the case with the textbook of the System Engineering Management [5] (Pages 6-2~6-3) used at the Defense System Management College of the Department of Defense of the United States. The FBS technique clarifies the relationship between the two and how to choose the right one at the right time (see section 2.3.4 of Chapter 2). Therefore, the DTCN method provides supplemental procedures and methods for performing parts of tasks that cannot be done by the conventional VE method.

### 3) The QC Method

The relationship between the QC method and the DTCN method will be discussed below [Answer (3)] with regards to other points.

The general considerations to be made concerning how to use the DTCN method to supplement and connect the IE, the VE and the QC methods are as follows:

4) By applying the PMD method, it is possible to extract the Domain of Thinking among the people concerned, to organize the domain into purpose-measure relationships, and to reach a consensus as to which methods (VE, IE, QC) are to be used, and how these method are to be used and for what purpose, even before applying the methods.

5) The Steplist method and its four frames make it possible to create a framework in which the IE method and the VE method are included in the input-output relationship of a work process without breaking the purpose-measure relationship clarified by the PMD method. Regarding the QC method, in the created framework, pre-assurance conditions that need to be included in the work process and the post-assurance conditions that need to be included in the decision-making process are well-balanced (see Figure 9.1-1).

6) It has been said that to precisely grasp or understand the challenges is the most important thing regardless of the type of method applied. However, until now, there has been no method for precisely grasping or understanding the challenges. The DTCN method established the Theme Key Word (Theme PMD) method and the Action PMD method as ways of resolving this issue.

7) Abduction/Hypothesis are usually reached to combine inductive and deductive thinking and action. The expression "abduction./hypothesis" has two meanings. One meaning is "the hypothesis to be set to explain natural phenomena and determine several propositions deduced from the hypothesis by experiments and observations." The other is "the future-structuring hypothesis, which is supposed to combine natural mechanisms with accessible resources in order to present a precise plan of how to understand certain subjects or challenges, and how to realize them, and to see if such a plan will work." For the time being, in order to differentiate the two meanings, the former is merely called the Hypothesis (Abduction), and the latter is called the Working Hypothesis (Future Abduction).

As to either of the two, conventional textbooks only touch on the existence of such ideas, and almost none of them describe precise and practical procedures for arriving at such a hypothesis or abduction [6].

With the PMD method, it is possible to understand the future structuring Working Hypothesis (Future Abduction) within the purpose-measure relationship and the Main Key Word, and to present procedures to arrive at the hypothesis. Therefore, the DTCN method, combined with the PMD method, the Steplist method, and the FBS technique, can present practical procedures to utilize the ideas of the Working Hypothesis (Future Abduction), induction, and deduction.

**(2) The NM Method, invented by Masakazu Nakayama, and the KJ Method (Affinity Method), invented by Jiro Kawakita, are excellent for producing ideas and understanding phenomena, but when it comes to linking them with concrete business, including VE, IE, and QC, there is a gap.**

**Isn't there a way of appropriately joining together and supplementing all these methods ?**

[Answer (2)]

The relationship between the DTCN method, and the NM and KJ methods is mentioned in section 3.1 "How to Create the Domain of Thinking and Consensus among the People Concerned" of Chapter 3 "Examples of the Application of the Basic Method." The author would like to add a few points.

1) The NM method is a method to extract wisdom that is said to lurk in the right sphere of the brain, which is called the imaginative brain, around the brain stem, which is called the trunk of abilities and life. Almost all methods, including this method, start by "look for the Key Word" or "determine the Key Word," but do not mention how to do this. The Theme Key Word method and the PMD method of the DTCN method present a way to clearly grasp and understand the Key Word. Thus, the Key Word, which is

reached by the DTCN method, strengthens the excellent know-how of the NM method.

2) In the KJ Method (Affinity Method), there are no restrictions on the types of expressions in writing cards, and the written cards are grouped according to similarities. That is why the KJ method bears close resemblance to a grouping method. The KJ method, unlike the DTCN methodology, does not have imperative characteristics such as "follow the PMD method to establish businesses that should be based on clear purpose-measure relationships," "apply the four frames or the Steplist method to create the procedures," and "in order to create an imaginary structure of a subject, arrange all the expressions that can be thought of or felt according to the rule of the FBS technique."

The KJ method is based on a principle that allows one to freely arrange, group and connect cards. In this sense, it can be said that the KJ method not only has wider scope than the PMD and Steplist methods, but also includes them. Plainly speaking, the DTCN methodology, which includes the PMD method and the Steplist method is a management-type method, whereas the KJ method, although very flexible, is a grouping-type method and is suitable for the humanities and field research. (In field research, the KJ method can be applied to put the outcome of research into writing, to share and confirm information and knowledge among the parties concerned, to lead the parties to the next level, or to understand these situations.)

In any case, the DTCN methodology is supplemented by the wider-ranging concept of the KJ method, and by the shared information that is made possible by the KJ method, which allows the parties concerned to view the situation from different perspectives. Therefore, the DTCN method can be seen as one of the management-type methods found in the KJ method. In other words, the KJ method produces the Understanding Structure, whereas the DTCN method yields the Management Action Structure.

**(3) Project management is supposed to start from the GANTT chart and WBS (Work Breakdown Structure), but there is no established procedure to create faultless and phased procedures or a WBS before the GANTT chart.**

**Isn't there a good way of creating such procedures?**

[Answer (3)]

1) Steplist Management is the method to create the faultless and phased procedure before making a GANTT chart.

- 2) The FBS (Function Breakdown Structure) technique is the method to create the most effective WBS, or to review and improve the conventional WBS.
- 3) PMD is the method to focus on the key function or expression of the objective result before using the method of steplist or FBS technique. Also PMD is the method to create the same direction of value among the people concerned.
- (4) When developing new products or organizations, or improving cost and performance in industry and government, a wide range of Structured Quality Assurance (QA) and Quality Control (QC) become necessary for thinking and work processes.**

**Isn't there a good way to assure such processes are structurally faultless?**

[Answer (4)]

Figure 9.1-1 shows the relationship between the four frames of the Steplist method and the concept of QA, Inspection, Quality Improvement and QC.

1) Based on Figure 9.1-1:

- QA (Quality Assurance) means to assure pre-assurance activity and post-assurance activity conditions.
- Inspection means to sample the "tasty meal."
- QC (Quality Control) means to balance the effective cost and work done in QA activities and in the overall project.
- QI(Quality Improvement) means to improve the effectiveness in Quality Control, by moving the quality improving element to upper stream of working processes.

2) The Steplist method is used to provide a framework to give the appropriate assuring conditions and control framework of assuring conditions effectively and efficiently to reach the objective result in the overall project using the Production, Inspection, QA, and QC Methods.

3) In addition, the Steplist method can be used to divide a big project into phases. Therefore, it will become easier to use the method of IE, Production, Inspection, QA, and QC methods in each appropriate phase.

4) Moreover, the evaluation method or standard in each phase of the development project, which had previously never been precisely explained, are clarified through PDM, the Steplist method, the structuring technique described in Chapter 4, and the Trade Study method of the DTC method described in Chapter 7. (Evaluation means to create a value in each phase of the development project.)



- (5) **A manager realizing a task must orient the parties concerned in a common direction, generate consensus and motivate people.**

**Cannot one create a clear measure or procedure for doing these things?**

[Answer (5)]

1) It is possible for the people and parties concerned to be motivated and to reach consensus if they create PMDs whenever possible.

2) A supervisor will be able to better understand the meaning and the rough procedure of the project in question by reading the PMDs than through verbal explanations. In addition, a supervisor will be able to make suggestions.

3) By differentiating the "why"-type question of the scientific method from the "in order to do what," "how to do" (i.e. "in order to do something, it is necessary to do something")-type questions that are asked to create something new, it is possible to clarify the difference between the scientific method, which explains existing methods and the engineering method, which establishes something new based on an outcome reached by the scientific method, and therefore, choose the best of the two at the right time, or appropriately combine them.

The points described above are the answers to the challenges that revealed the needs for this method. Based on these answers, Figure 1.1-3 "Purpose-Measure Diagram of DTCN Thinking and its Procedures" from Chapter 1 is again shown as Figure 9.2-1. In the figure, as to the IE, the VE, and the NM methods, the DTCN/DTC method is described as a supplementary method which connects the procedures and images of the three methods. On the other hand, for the QFD (Quality Function Development) [8] method and the KJ method, the DTCN/DTC method is described as a method that assures the two methods.

The entrance point for the QFD method is the language and the image/scene addressed to the customers, whereas that of the DTCN/DTC method is the theme/subject and the cost. Because of this, these two methods might be combined in the future to supplement each other and to create a new method (as of 1995). Dr. Arao, originator of the QFD Method, has occupied the office next to the author's at Asahi University in Gifu since 1995.

- (6) **To achieve a concrete target cost or performance, the operation must be divided into steps.**

**How can these steps be set to achieve a creative faultless rational process and its decision-making?**

[Answer (6)]

The DTCN and DTC by the DTCN Method clear this problem as stated in this book.

**(7) In the above, there is some confusion between the scientific method and the engineering method, and a proper coexistence is called for.**

**Isn't there a way of appropriately dividing and combining these two methods?**

[Answer (7)]

This book reveals the proper use of "in order to do something, it is necessary to do something," or "in order to do what," "how to do"-style questions in the form of the Engineering Method, and "why"-style questions in the form of the Scientific Method. As regards these questioning styles, this book mainly talks about the Engineering method to create future matters, or structured matters by human wisdom.

### **9.1.3 Other Points Made Clear and Feasible through this Publication**

**(1) First of all, the goal of a research and development project is as follows:**

"There is always a customer in any research and development project. The important purpose of an R&D project is to satisfy the customer's needs."

**(2) Next, as a step to accomplishing the goal reasonably, effectively, efficiently, and appropriately, the following mechanisms, which operate unconsciously in our daily lives and which have never been explained in conventional textbooks, and the ways to utilize these mechanisms are clarified.**

A. The decision-making mechanism and the appropriate way to use it.

B. Differentiating the proper ways to use the "what for and how," or "in order to what," "how to do," or "in order to do something, it is necessary to do something"-type questions and the "why"-type question from the improper ways of using them in order to direct the vectors of creative thinking and action in the same direction.

**(3) The following seven methods are the basic methods of DTCN which accomplish a goal by using the above concept and procedure.**

1) The PMD (Purpose-Measure Diagram) method (also known as the Key Word method):

- A. Creates proper purpose-measure relationships (especially when starting something new).
- B. Finds a proper expression of the goal, that is, the Main Key Word, and confirms it.
- C. Directs the people concerned in the same direction so that a common decision concerning the goal is reached.
- D. Clarifies where to start, that is, the Entrance Key, in order to meet the goal.
- F. If the subject or challenge, or the expression of the challenge or mission is unclear, it finds the proper expression and confirms it.

In this method, cards are created pertaining to the subjects or missions to be realized among the people concerned in order to make the preceding points possible. In addition, directing knowledge and values regarding the issue or topic within the group is also made possible through this method. (In this publication, the knowledge and direction of values for various issues or topics combined are defined as the view of value.)

2) The Steplist Management method:

With this method, it is possible to create a faultless phased procedure to realize the goal.

3) The FBS technique:

With this technique, the process to create a proper image structure of the goal is clarified.

4) The WBS Phasing Theme technique:

With this method, it is possible to gather themes/ideas which need to be discussed to accomplish the goal, and examine them in a timely manner in each phase of the project.

5) The 3-5 Phase Improvement method:

With this method, it is possible to divide an improvement plan into three or five different phases, and to proceed with a well-balanced improvement plan.

6) The Root Organizing method:

With this method, it is possible to realize something new within an organization through root binding negotiation.

7) The method of implementation plan document and follow up:

This method enables the head of an organization to approve the procedure to apply methods 1) through 6) to each project and confirm them, and follow up the implementation plan itself.

**(4) As a further application of these basic methods, the procedure to apply the DTC method, which was one of the methods whose procedure had not been previously established, is put together as "the DTC method by the DTCN methodology." With this procedure, the concept of the DTC can be effectively realized.**

#### 9.1.4 Practical Outcomes

The major practical outcomes are as follows:

(1) In the Defense Agency development project of the XT-4 medium-class jet aircraft, which started in 1986, the target cost of mass production, performance, and development schedule were all met. In addition, a logistic support implementation plan as the post-assurance activity and the framework to carry it out were drafted and implemented.

(2) The National Space Development Agency (NASDA-STD-4) "The Design to Cost Implementation Standard" was created by this method. In addition, the application of the DTC method in the H-II rocket and the space station were realized in line with this standard.

(3) The introduction of emergency medical helicopters and the emergency medical staff system in each prefecture began to be discussed, and is being realized.

(4) NASDA formed a long-term plan for an information system.

(5) A construction plan for an institute for disaster medicine under the National Defense Medical College was drafted and realized.

Table 9.1-1 summarizes these outcomes and others. In addition to those included in the table, there are more than 300 PMDs that have been created by the PMD method since 1993.

#### 9.1.5 Further Applications of the Methods Found in this Publication

The methods found in this publication can also be applied to the following situations:

(1) As a method for creating procedures within the physical/chemical limit of an individual or a group to resolve problems, or to realize the theme or subject found in daily life in which the people concerned do not know how to tackle a problem, or theme/subject.

(2) As a method to transform a conceptual idea into a procedure that can be implemented.

(3) As an algorithm which is the intellectual core of an organization, as the framework of an information system, or as a method to develop a system.

#### <References>

[1] Seisan Kanri Hensyu Iinkai, Seisan Kanri Binran (Production Control Handbook), Maruzen (1962).

[2] Nihon Keieikogakkai, Keikogaku Binran (Industrial Engineering Handbook), Maruzen (1975).

[3] Kawasakijuko Seisan Gijutsubu, Kanri Gijutsu no Kihon (Basics of Management Engineering), (1977).

[4] VE Yogo no Tebiki Senmon Bunkakai, VE Yogo no Tebiki (Guide to VE), Nihon Value Engineering Kyokai (1992).

[5] Department of Defense, System Engineering Management Guide 2nd Edition, Defense System Management College; USA,(1986); pp. 6-2~6-3.

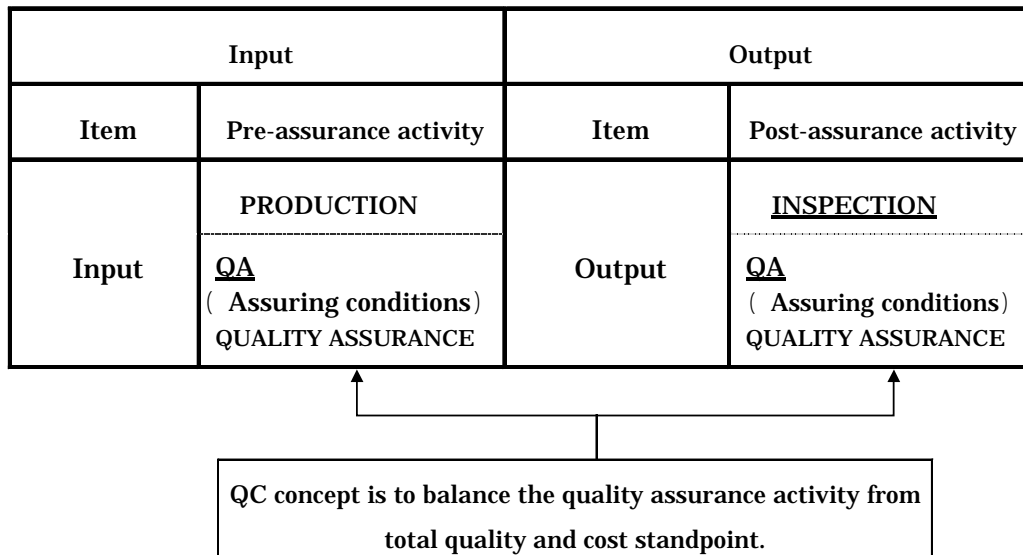
[6] Masakazu Nakayama, Eneki/Kino Katei Settei: Atarashii Kagaku no Hoho (Method of Induction, Deduction and Abduction), Sandai Publishing Co.(1979).

[7] Jiro Kawakita, Hassoho (Concept Method), Chukoshinsyo (1967).

[8] Yoji Akao, Hinshitsu Tenkai Nyumon (Quality Function Deployment), Nikkagiren (1990).

Figure 9.1-1 The Relationship of QC, Inspection and QA by Four-Frame Steplist

**QA inspection and QA concept can be allocated as follow in steplist four frame**



**Upper stream for QI(Quality Improvement)**



So, we can understand that

- (1) TQC (Total Quality Control) is the control concept to solve the problem and balance the quality assurance.
- (2) TQM(Total Quality Management) is the management concept to realize the theme or subject. By using the concept of TQC.

Figure 9.1-2 The Purpose-Measure Relationship of DTCN Methodology

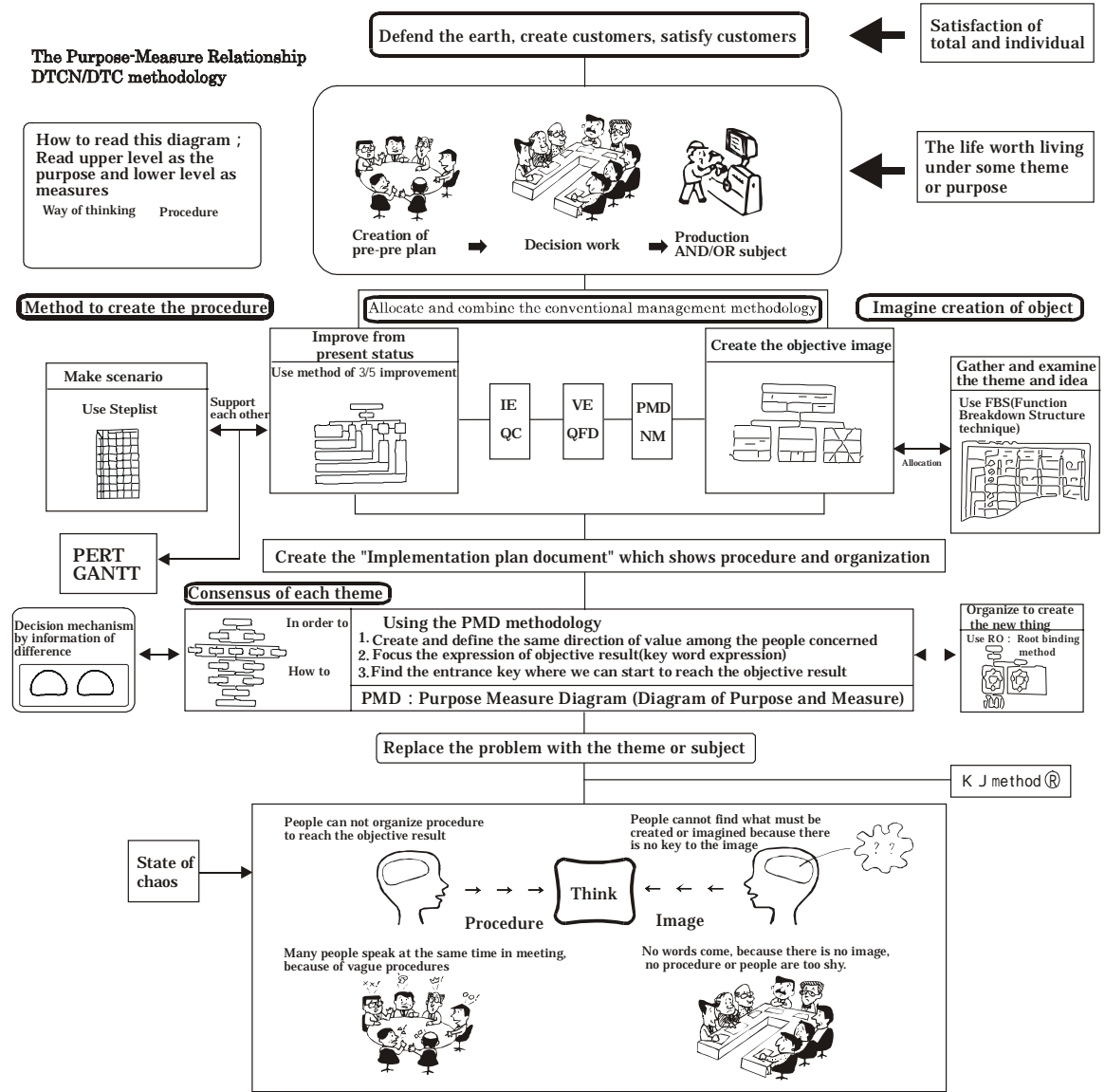


Table 9.1-1 Main Past Application Results of DTCN/DTC Methodology

## As of 1992/12

No	Time	Related organization	Project	Methodology	Contents
1	1978~1982	Kawasaki Heavy Ind. and Messerschmitt Bolkow Blohm GMBH	Development of BK 117 helicopter	DTC	First application to a project. Successful, except in engine cost.
2	1981~1988	Japan Defense Agency, Kawasaki, Mitsubishi, Fuji Heavy Ind. and equipment vendors	XT-4 jet trainer aircraft	DTC	Successful in development cost, production cost, performance and reliability; all on target
3	1985	NASDA (National Space Development Agency) and related contractors and vendors	<ul style="list-style-type: none"> <li>• H-rocket</li> <li>• Satellite</li> <li>• Space station</li> </ul>	DTC	<ul style="list-style-type: none"> <li>• DTCN / DTC methodology is the DTC implementation standard baseline of NASD-STD-4</li> <li>• Provide with rules and regulations in NASDA</li> </ul>
4	1984	Ministry of Home Affairs, Medical Society	Creation of helicopter emergency medical system <b>Requires the creation of a new paramedic social system</b>	DTCN	<ul style="list-style-type: none"> <li>• PMD was used to create a new system in the bureaucratic system.</li> <li>- Established medical target time to begin treatments of emergency patients.</li> </ul>
5	1988~1989	NASDA (National Space Development Agency)	Total Information System	DTCN	<ul style="list-style-type: none"> <li>• Overcame the initial chaos to develop a huge total information system. Also made a long-range implementation plan and concept</li> </ul>
6	1989	Japan Defense Agency, Kawasaki Heavy Ind.	Total logistic and long range concept and support plan	DTCN/DTC	Team leader
7	1989	Defense Medical University	Conceptual plan for research institute of emergency medical system	DTCN	
8	1991~1992	Conceptual plan for research institute of emergency medical system	Chapter on Project Planning and management of Aerospace Handbook, published 1992	DTCN/DTC	Made a draft of conceptual plan. University got first budget from the Government
9	1992	Japan Management Association Consulting Co.	(1) CIM creation and structuring program by Mr. Eguchi	DTCN/DTC	Mr. Eguchi, Consultant, created cost-half-program
10	1992	Same as (a)	(2) Revolutionary program for improvement of production, function and quality by DTCN.	DTCN/DTC	Mr. Hirose, Consultant, created a new engineering methodology and procedure to structure the approach process for optimizing production processes



## **9.2 Future Perspectives and Challenges**

**9.2.1 Consolidation of Existing Concepts into Further Supplemental Applications (Structured Procedures and Images)**

**9.2.2 Actual Application of the DTCN Method in a Report concerning Proposal No. 19, "Basic Research Plan for Software-Related Technology" of the Science and Technology Committee Dated Dec. 12, 1992 [3]**

As completed, the contents of this publication can be developed as follows:

### **9.2.1 Consolidation of Existing Concepts into Further Supplemental Applications (Structured Procedures and Images)**

That is,

#### **9.2.1.a As a Consulting Method**

There are people who have already created the following system based on the DTC method, which is a part of the DTCN method, and have begun to utilize it. Future development should follow along the same lines.

- (1) FA (Factory Automation) construction program, based on the DTCN method, by Mr. Kazumi Eguchi of Japan Management Association Consulting Inc.
- (2) Work improvement program, based on multiple-variable analysis by the DTCN method, by Mr. Tetsuzane Hiroshige of Japan Management Association Consulting Inc.

#### **9.2.1.b Practical Use of the GDSS (Group Decision Support System) through the DTCN Methodology**

It is essential to make GDSS software and GDSS through the PMD method available.

The ultimate goal is to make the subject system a common tool worldwide.

(1) According to a report from a person in the United States, various government agencies have shown strong interest in PMD software. These agencies include (as of December, 1992):

- 1) The Department of Defense
- 2) The Defense System Management College
- 3) The Department of Energy
- 4) The Department of Treasury
- 5) The US Navy

- 6) The Federal Aviation Administration
- 7) The Central Intelligence Agency
- 8) The Army Corps of Engineers Fusion Center
- 9) The National Security Agency
- 10) The National Aerospace Agency

(2) In addition, the author was given an opportunity to discuss this method with officers from agencies of Japan's central government in December 1992. They (excluding the Defense Agency) showed great interest in the method.

9.2.1.c Apply the DTCN method to the organized intelligence developing method [1], advocated by Mr. Takehiko Matsuda, and its algorithm.

9.2.1.d Create a well-organized application method through the DTCN method to be used in implementing the QFD (Quality Function Development) method [2].

9.2.1.e In recent years, various project management programs have been developed. Almost all of them start by creating a project procedure and with the WBS technique. Thus, there is a need to rearrange the existing software to be used in creating such procedures and with the WBS technique. Based on this rearrangement, a "paradigm of project management software" that follows the "paradigm of word-processing, accounting, and diagram-drawing software" will be created.

## **9.2.2 Actual Application of the DTCN Method in a Report concerning Proposal No. 19, "Basic Research Plan for Software-Related Technology" of the Science and Technology Committee of the Japanese Government Dated Dec. 12, 1992 [3]**

The author would like to present proposals regarding the concerns, expressed in Chapter 2, on a report about Proposal No. 19, "Basic Research Plan for Software-Related Technology" of the Science and Technology Committee (Dec. 12, 1992).

### **9.2.2.a Important Basic Domains**

(1) Generally speaking, subjects or themes whose research has just been started, and R&D projects that

have not shown good progress, although their importance has long been recognized.

In these subjects or themes, in order to:

- 1) Create a new value and set a new goal; use the PMD method.
- 2) Apply new measures to move to a new level of function; use the PMD and implementation plan document method.
- 3) Make diverse approaches possible; use the 3-5 Improvement method.

(2) How to understand contradictions in human thought and action

In the DTCN method, three types of questions, "in order to do, how to do," and "why?" are differentiated and the most appropriate one is asked in each set of circumstances. It is advisable to use the PMD method so that the factors and processes that lead to contradictions in human thought and action will be clarified. In addition, a foundation for software-oriented technologies will be created.

(3) How to analyze characteristics rooted in the cultural environment

It is advisable to take a couple of examples from various ethnic groups and cultures, and create a PMD for each example. Provided the perception gap between the different ethnic groups and cultures can be narrowed in the PMD, this will allow information to be shared, and different characteristics to coexist.

In the past, cultural characteristics were analyzed only by comparison. It is desirable to bring the characteristics together and create purpose-measure relationships among them through the PMD Method so that the characteristics from various cultures will complement one another. In the purpose-measure relationship through the PMD Method, the characteristics, meaning, and significance of each culture will be better clarified.

(4) How to understand common sense

When one compares the way cards or blocks are connected in the KJ method, the MN method, the PERT, the GANTT Chart, the FAST Diagram, and the DTC method, one notices that the upper-lower and right-left relationship between the cards as well as the direction of the connection (the purpose-measure relationship, the input-output relationship, etc.) construct a common awareness among people (see Chapter 3, Table 3.1-1 "Comparison and Relationship between PMD and Other Creative Thinking and Procedural Thinking Techniques").

When comparing the above experience with the examples found in the Bibliography in [4] and [5], there is consistency in terms of where certain information is stored in the brain, and how it is extracted (direction of nodding) and inserted (direction of going into the right and the left eyes). Because of this consistency, the "common sense shared by all human beings" and the "common sense shared by members of one culture" can be extracted by comparison. The extracted common senses can be utilized as an interface between humans and hardware, and be developed into a system that is user-friendly and avoids danger. To this end, it is advisable to refer to the following examples given in this publication.

(Reference)

Episode 1. PMD Method and nodding when trying to understand something

Episode 2. PMD Method to investigate language

Episode 3. PMD Method can clarify "chicken or egg" relationships

Episode 4. The Method of Key Question

Episode 5. The relationship between PMD, Steplist, FBS, and 3-5 Phase Improvement method

Episode 6. Accumulation of Knowledge and Wisdom

Episode 7. Differences in the way men and women think

Episode 8. A strange phenomenon in visual recognition: a difference between men and women

Episode 9. The difference between males and females in dextro-rotation and levo-rotation

(5) How to advance basic technologies

\* Use the PMD as an information compression technology.

\* Standardize the PMD method so that the PMD method will be a universal tool like PERT, and create manuals. By doing so, knowledge and wisdom from around the world can be connected and compressed.

9.2.2.b Research into Software-Related Technology that Targets Humans and Society

(1) Mechanism for facilitating improvement in intellectual activities

1) Regarding "To Reveal the Mechanism of Intellectual Activities and to Develop Research & Development of Methods and Systems that Facilitate the Mechanism":

\* Use a decision-making mechanism that makes use of the information of differences

\* Use the mechanism of the PMD to form the direction of value that accepts the information differences

\* Apply the mechanism described in the section "Decision Mechanism by Information of Differences" when controlling awareness, spatial positioning and order, where the information of differences is input.

2) To create a system that facilitates cooperation within a group composed of individuals from various intellectual backgrounds, refer to "How to Create the Domain of Thinking and Consensus among People Concerned" (section 3.1) and "Details of the Steplist Method and Advanced Analysis" (section 3.2) to create a standard system.

3) Develop the above system to create a standard method that can correspond to differences in knowledge and ways of thinking resulting from the differences between individuals, groups, and cultures.

4) To reveal the intellectual mechanism within a group

Reveal the methods to construct and apply an intellectual mechanism in a group first by using the DTCN method and others, instead of referring to the same methods as in section 2). Then explain and analyze the applicable mechanism in the course of proceeding with the methods.

5) Research & Development of Methods, Tools and Systems that Facilitate Intellectual Activities

\* Use the DTCN method as a framework since method is in use. Clarify when and where other tools and systems should be used so that they can be most effective.

\* Regarding "Research on Evaluation Methods for the Systems and the Tools," go back to the original meaning of the English word "evaluation (ex. value)" i.e., "to create a value or emphasize a value," and create an evaluation method that allows broad and multi-step evaluation. To this end, take advantage of the trade study method found in the PMD method, as well as the Steplist method, and produce an evaluation method that can be developed further. Unlike conventional evaluation methods, this new method should also be subjected to evaluation (in a sense, the DTCN method can be used as a method to evaluate itself).

6) Research on the Tools that Support Logical Thinking

Begin the process by differentiating the Scientific Method, which analyzes existing mechanisms and starts with the hypothesis "Why does A happen?" from the Engineering Method, which starts with the hypothesis/future abduction "in order to something, it is necessary to do something." For this purpose, refer to section 1.3 "The Proper Use of Questions for Creative Thinking and Decision Making" and Figure 2.8-3 "The Comparison of the Steplist Management Process with Conventional Management Processes."

\*In order to effectively promote the human way of thinking from a vague stage to a confirmed stage, use "grade of estimate" in Fig. 6.2-3. In order to clarify where the vagueness lies as well as how to improve the

clarity, use the PMD, the Steplist, 3-5 Phase Improvement, and the FBS Technique.

#### 7) Research on the Tools that Support Intellectual Activities, including Inspiration and Creation

\* First of all, develop a computer platform that contains the KJ method, the NM method, the DTCN method and the QFD method, which fit into Japanese culture well.

\* Then develop software that supports higher-order intellectual activities.

\* Improvements on US-invented methods, such as the FTA (Fault Tree Analysis) and the FMECA (Failure Mode Effect and Criticality Analysis) should be included in the software.

\* At the same time, choose a new symbol, or a Chinese character to display the new concept.

#### 8) International Intellectual Activity

Apply the same method as in 7) to attach international characteristics.

#### 9) Human Interface

Clarify the mechanism of human interface with the help of "Sexual Differences in Sending and Receiving Images, and the Creative Application of the Differences" described in the Bibliography [5]. At the same time, start creating the PMDs for several topics to find the Key Word.

\* After finding the Key Word, create a new interface through the NM method.

\* Next observe, analyze, and establish the process of creating the new interface. Then construct a mechanism that will automatically create a new interface, integrate it with existing interfaces, and secure easy access to them.

In constructing the mechanism, international characteristics are vital. Thus, it is necessary to appeal to suitable international organizations, such as the United Nations, or to give support to establishing an appropriate research institution within the United Nations University.

#### 9.2.2.c Research & Development on How to Improve the Living Environment and the Pleasantness of the Social System, and How to Construct Such a Society by Clarifying the Characteristics of Sensibility

1) Focus for the time being on how to establish a peaceful society in a remote area. To be more specific, construct a social system to cope with emergencies and to preclude dangers (for instance, an emergency medical system, including emergency helicopters with a doctor or medical staff on board: an item supported by the Fire Defense Agency, the Ministry of Home Affairs).

## 2) Analyze the Characteristics of Sensibility

Establish facts of gender difference, including the difference resulting from the terrestrial magnetism described by Tadanobu Tsunoda [6], and ways of controlling the difference by utilizing both the concept of the DTCN method and the outcome of various research, such as "Gender Difference in Sending and Receiving Images and Creative Application of the Differences" [5].

## 3) Basic Research on Pleasantness Improvement

During the process of satisfying an individual and overall society, regard life fulfillment as one of the focal points of pleasantness. Next, narrow the focus to a group that includes the elderly and the disabled. Finally, start forming a new value, including within yourself, through the concept of the DTCN method.

To this end, the real topics that the Ministry of Health has been having difficulties addressing are used as an experiment for establishing the method. The first step is to assist the departments in charge in creating a PMD for each topic, following the example of the emergency medical helicopters. Based on the created PMDs, set an example of a procedure to be followed in drafting an integrated administrative plan among governmental agencies. Then, standardize the procedure and ensure that it is widely used.

## 4) Research on How to Construct a Peaceful Society

1) Focus for the time being on how to establish a peaceful society in a remote area. To be more specific, construct a social system to cope with emergencies and to preclude dangers (for instance, an emergency medical system, including emergency helicopters with a doctor or medical staff on board: an item supported by the Fire Defense Agency, the Ministry of Home Affairs).

## 2) Analyze the Characteristics of Sensibility

Establish facts of sexual difference, including the difference resulting from the terrestrial magnetism described by Tadanobu Tsunoda [6], and ways of controlling the difference by utilizing both the concept of the DTCN methodology and the outcome of various research, such as "Sexual Differences in Sending and Receiving Images, and the Creative Application of the Differences" [5].

## 3) Basic Research on Pleasantness Improvement

During the process of satisfying an individual and overall society, regard life fulfillment as one of the focal points of pleasantness. Next, narrow the focus to a group that includes the elderly and the disabled. Finally, start forming a new value, including within yourself, through the concept of the DTCN method. To this end, the real topics that the Ministry of Health has been having difficulties addressing are used as

an experiment for establishing the method. The first step is to assist the departments in charge in creating a PMD for each topic, following the example of the emergency medical helicopters. Based on the created PMDs, set an example of the procedure to be followed in drafting an integrated administrative plan among governmental agencies. Then, standardize the procedure and ensure that it is widely used.

#### 4) Research on How to Construct a Peaceful Society

\* Create several risk management systems and evaluation tools for them by joining the DTCN method, the CRM (Cockpit Resource Management: one of the risk management systems used in aviation services) system, and other methods. These systems and tools can be used in risk management on a daily basis.

\* Also, connect the created systems with the system designed to lighten the burden of caring for the elderly and the disabled.

### 9.2.2.d Research and Development to Support Intellectual Activities in Organizations, and to Address Various Problems found in Society

#### 1) Research on Intellectual Activities in Organizations

The DTCN method is suitable for intellectual activities.

Work closely with the Ministry of Education to develop teaching materials that explain how to use the method in plain language, and adopt them in primary and secondary education. It is important to repeatedly use the PMD method to prevent ideas from being overly divergent.

#### 2) Create Intelligence in Organizations

Make "logical algorithm" and "inspiration" two pillars of the creation of intelligence and ensure the coexistence of the two through the WBS Theme Phasing technique so that the creation of intelligence will proceed systematically. It is vital to formulate a long-term plan that includes developing prototype computer software in order to accomplish the creation of intelligence.

#### 3) Approaching Social Problems through Methods that Unite Natural Science, the Humanities, and the Social Sciences

\* Address difficult issues jointly with the government officers in charge by referring to the KJ method, the NM method, the DTCN method, and the QFD method.

\* Standardize the case studies and methods established through the example.

\* Consult with an independent organization or a consulting firm if the issues cannot be resolved by the officers themselves.



\* Research on modeling and simulating should proceed when necessary, and aimed at practical use from the start.

#### 4) Research on Science Technology

Apply concept 3) to a couple of difficult topics facing the Science and Technology Agency. Conventionally, the DTCN method has been used in product development. However, by applying the method to basic technology development in reality, the essential conditions for using the method for this purpose as well as a method to evaluate it from various angles will be created.

#### 9.2.2.e Research and Development of Software-Related Technology Targeting Hardware

##### 1) Research and Development of Software Aimed at Assisting, Replacing and Expanding Human Functions

\* Input the PMD of a specific topic into a computer and conduct research into the possibility of developing an autonomous system.

2) With respect to the functions and characteristics of human beings and the ecosystem, conduct research on what types of functions should be added to a PMD in order to have similar or the same self-organized function in the combined form of hardware and software.

3) Furthermore, explain the mechanism of emotion through the hypothetical (abductive) link that is thought to exist between the creativity of the brain and spatial positioning methods, such as the PMD method.

##### 4) Research on Assisting, Replacing, and Expanding the Physical Functions of Human Beings

Based on existing technologies and the outcome obtained by proceeding as above, find a topic in each field and formulate a long-term plan for each topic. The long-term plan which is created by the PMD method should be revised every two years.

The topics may include:

- A. Improvement of development and productivity, which may be developed in parallel
- B. Creation of supporting or additional functions for the elderly and disabled
- C. Advancement of the information network
- D. Desk system that could improve the abilities of an individual (this can be applied immediately in the Science and Technology Agency). (C and D, in particular, should first be implemented in the Science and

Technology Agency.)

E. In relation to verbal and non-verbal simulations based on ethnic and cultural background, draft a preliminary long-term plan and an implementation plan by referring to the method described in the Bibliography [7] and the DTCN method.

5) Research to Secure the Reliability of Large-scale Systems

\* Draft a development plan for a method that exceeds the FTA and the FMECA, which only preclude man-made errors.

\* Conduct necessary research on the factors involved and proceed to preliminary experiments.

6) Research into Information Processing of Emotions and Sensitivities of Human Beings

\* Conduct engineering research based on the changes in the frequency of response between the right and the left sphere of the brain according to age [6].

\* At the same time, use the hypothesis that information is transmitted between the right and the left sphere of the brain as a half tone (Michihiko Ezaki, unpublished).

\* English-speaking people often shake their heads right and left while they speak.

Examine under which circumstances they shake their heads to the left, and then to the right, and vice versa. (The rule has almost been explained.)

7) With respect to issues such as the global environment, computer crime and urban problems, start by creating a PMD for each topic and revise the measures to cope with each issue.

9.2.2.f Rearrange and Enrich the Environment and Organization for Research and Development Programs of Software-Related Technology

(1) By transforming R&D methods into software with the help of the DTCN method, prepare room for:

\* standardization

\* specific examples

(2) Based on the software, make an implementation plan among the people and parties concerned which consists of a system, preparedness and implementation, and follow up with it.

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