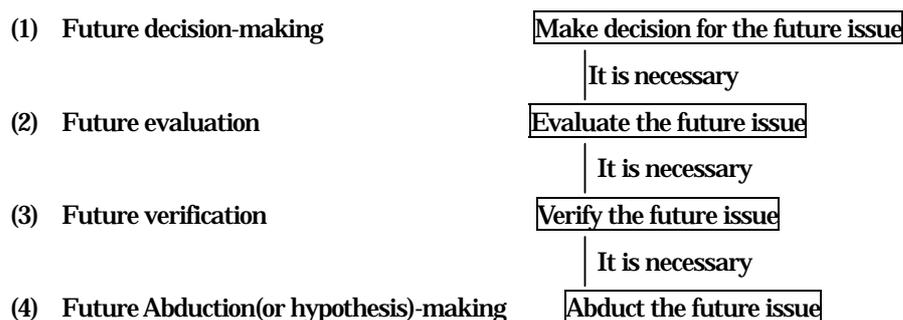


### Episode 13 Contents of the terms, “abduction,” “verification,” “evaluation,” and “decision-making”

Whereas Episode 12 clarifies the terms “verify” and “evaluate” to some degree, in this episode, the way of thinking and actions corresponding to the terms, “abduction” and “decision-making,” which should be performed before and after verification and evaluation, will be discussed. As described in Episode 12, both “verify” and “evaluate” are used for future and past aspects. Therefore, ‘to abduct’ is divided into past and future abductions, and ‘decision-making’ into past and future decision-making.

With the way of thinking of Design To Customer Needs discussed in this book, it is easy to prepare a PMD of “abduction,” “verification,” “evaluation,” and “decision-making” in the future.

Using the PMDs of “abduction”, “verification”, “evaluation” and “decision-making” in the future, the models corresponding to those in the past were studied. As a result, the following figure showing the relationship between a steplist and the PMD procedure was obtained:



According to the PMD and Steplist management form framework,

- (1) A decision is made by moving from the secondary information collection stage of the 4th stage of the steplist to the basic items of the 5th stage (change from an inductive to a deductive approach)
- (2) The contents verified for the future which are created in idea and breakdown structuring phases are evaluated toward the future in the second information collection phase of the steplist form.
- (3) Based on the Abducted expression (key word), First information collection, idea creation and structuring- related jobs are done in the steplist form framework so that the realization of the key word (Expression of the future abduction) can be believed to be realized as the future matter.
- (4) A PMD is prepared and the expression of abduction for a future issue is made with the key word.

The following is an example to explain the contents:

Because the author now teaches in a university, the process for a student to complete a graduation thesis

is used as an example.

- (1) A PMD, as shown in Figure 1, is prepared.
- (2) The graduation thesis is completed according to the PMD. Figure 2 is the steplist until the student is satisfied with it (8E in the steplist).
- (3) Figure 3 is a list of the example process from the stage of the abduction to the stage of full decision-making before the production of "Desk for easy study".

By comparing Fig. 3 with Fig. 1 and Fig. 2, we can recognize that Fig.1 corresponds to the process of future abduction "as to complete the thesis" and that Fig. 2. corresponds to the procedure contents to materialize the future result abducted expression of "to complete the thesis."

Fig. 3 shows the structure creating contents of future result abduction, verification, evaluation, and decision-making.

There have been only 2 books about abduction in Japan since World War II .

- (1) Nakayama, Masakazu, Deduction, induction, and abduction, (Sanno University Press, 1974)
- (2) Tobioka, Takeshi, Way of Thinking with Abduction, (Goma Press, 1994)

The thinking of Abduction is referred to by Charles S. Peirec (1839-1914, United States) as the essential scientific way of thinking, together with induction and deduction. However, he did not mention how to make the procedure a abduction (or hypothesis), and only unedited papers remain after his death.

Therefore, there are no papers or books which explain the procedure how to make and properly use past and future abduction-making in a visible form.

In this setting, this episode is useful.

Abduction (or some time hypothesis), verification, evaluation and the approval of decision and for past issues, such as the result of natural mechanisms and crimes, were clearly used because they were based on evidences that already exist.

However, although those for future issues were based on past evidence, the contents for each step for future were not clear because evidence did not exist before a decision was made.

This episode is the first explanation showing that this only works with clear causal relations from the primary information collection for PMD and steplist to the secondary information collection. Subsequent stages have to be carried out to make a future abduction (or hypothesis), verification, evaluation and decisions. This is detailed in Figure 3.

This example is the preparation of a PMD and steplist for the theme “a desk suitable for study,” which leads to the decision that the desk itself is built. That is,

- (1) There are large and small meanings of abduction-making, verification, evaluation, and decision-making.
- (2) The large meaning of abduction-making, verification, evaluation, and decision-making is the process shown as Line A in Figure 3. The contents are expressed as the work steps of the corresponding PMD and steplist in column of Line B. Space of column C is an image of the work of each steps.

The column A~C and D~E in figure 4 show the contents of the large and small meanings of future abduction, verification, evaluation, and decision- making

Lines D and E explain the contents of the small meanings of abduction (or hypothesis)-making, verification, evaluation, and decision-making.

The evaluation criteria at each step become definite by the value method expressed by the PMD, and by the movement from the output of the causal relation of the steplist showing the procedure in this figure to the next input.

#### Discussion

This episode explains the relation of future abduction, verification, evaluation, and decision-making that have existed and the issues to clarify their contents.

- (1) The use of a PMD and steplist allows for the clarification of the term, “future abduction” and the implementation of what to do for each theme/issue.
- (2) At the same time, the use of a PMD and steplist allows for the clarification of how the contents of “evaluation criteria” change step by step, and how they are positioned.
- (3) Because a PMD shows the repetitive relationship between purpose and measures and focused or abducted expression, i.e. Main Key word expression, it can clearly show the way of thinking for “The future abduction.”

Fig.4 shows the case steps to create the intentional future by the future abduction, verification, evaluation and decision-making for full scale implementatin.

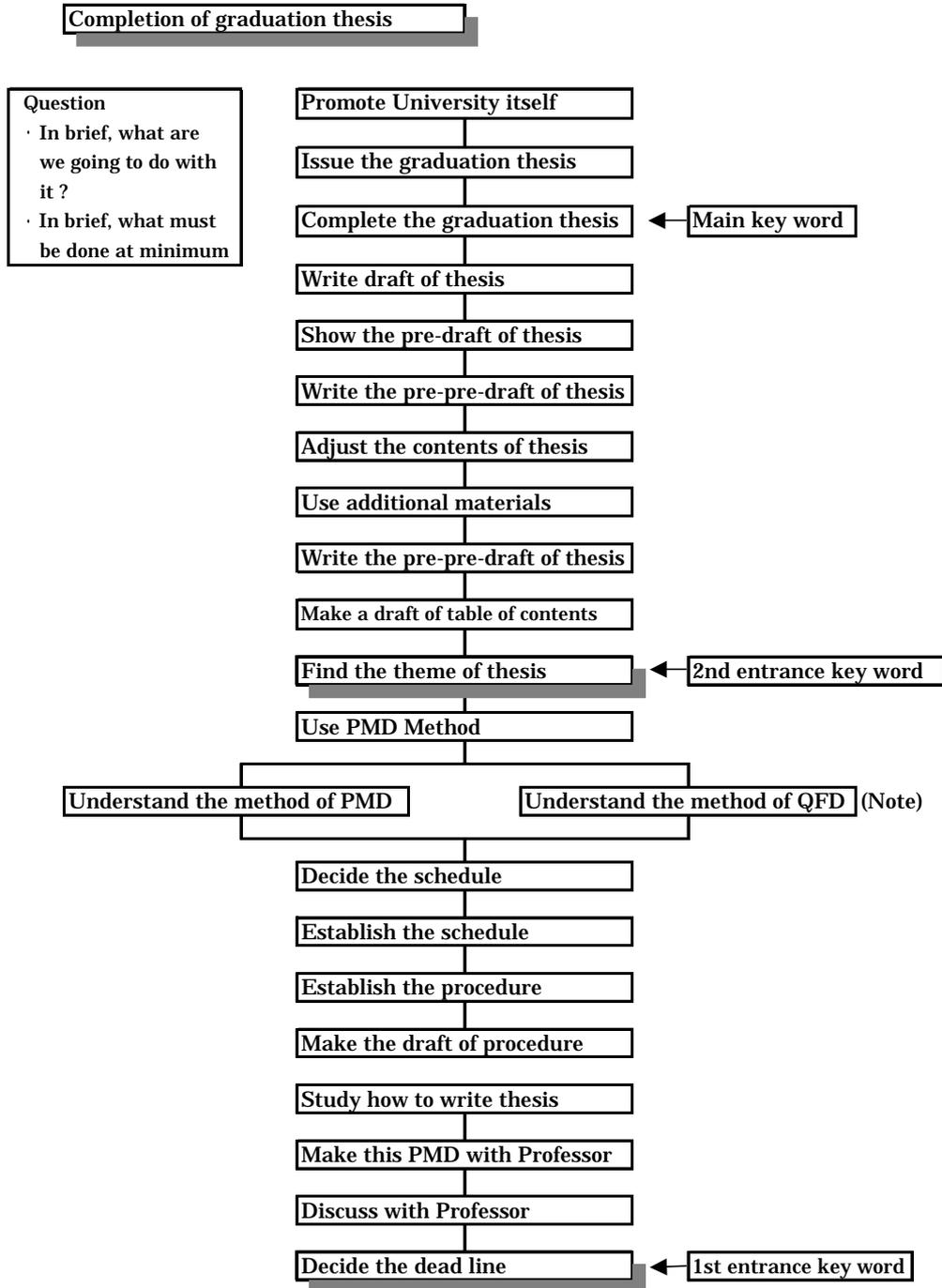
This can be done for existing or past phenomena using the way of thinking shape of Result-Cause Diagram (RCD) which shows the vertical result-and-cause relationship diagram of existing or past phenomena and by the Steplist starting from it for the contents of “The scientific abduction, verification,

evaluation, and affirmation” of past process or phenomena.

Also, this can be done for future natural phenomena using the way of thinking shape of Future-Result-Cause Diagram (FRCD) which shows the vertical future result-and-cause relationship diagram of future natural phenomena and by the Steplist starting from it for the contents of “The future scientific abduction, verification, evaluation and affirmation” of future natural results or phenomena.

Note: The techniques, CRD and FRCD, will be presented in another paper by author (1998). (See the details in the appendix H of this book)

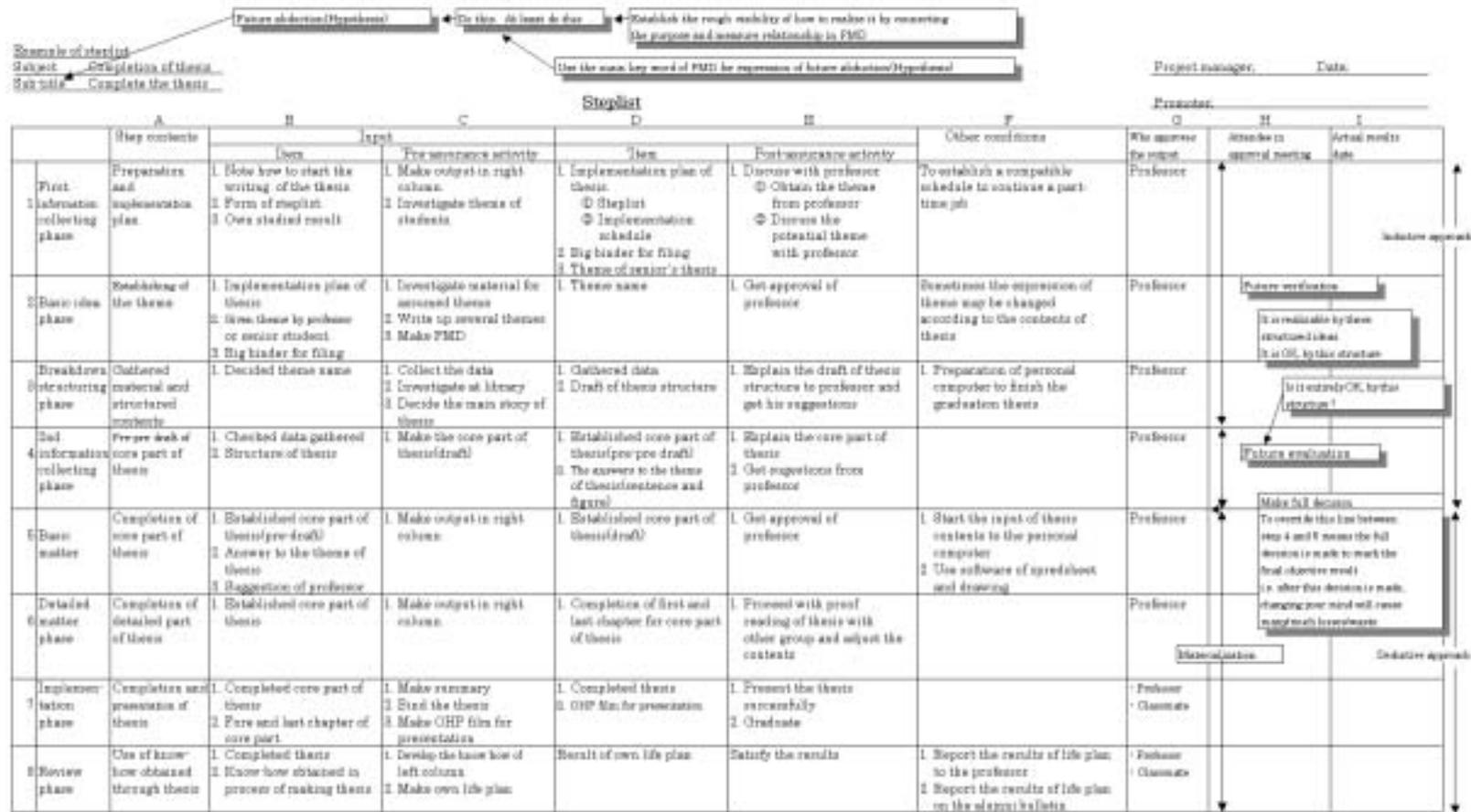
Episode 13 Fig. 1



(Note) QFD: Quality Function Deployment

1996.5.15 Made by Ueda, Sugiyama, Baba.

Episode 13 Fig. 2



Episode 13 Fig. 3

Example of future abduction, verification, evaluation, full decision-making for 'desk for easy study development'

A		B	C	D	E	
Basic process of abduction, verification, evaluation, full decision-making in wide reasoning		Corresponding work by FMD and step list	Example of actual working by FMD and step list	Narrow meaning of sub-process	Thinking and working contents of abduction, verification, evaluation and decision-making in narrow reasoning	
Abduction	Abduction	Make FMD	(Theme) 	Abduction	Make FMD	
				Verification	Verify whether able to structure a concrete purpose-measure relationship using our knowledge or not by making FMD	
				Evaluation	Evaluate FMD, the main key word and entrance key word of FMD from social standpoint	
				Decision-making	Decide to move to next step	
Inductive approach	Verification	1st information collection	Establish the persuasive, structured and proofed plan (This means verification)	Abduction	Gather the assumed ideas which can be used to realize the mainkey word expression	
		Basic idea		Verification	Verify whether the ideas are physically feasible or not by drawing the plan drawing from a technical standpoint.	
		Breakdown structure		Evaluation	Evaluate the drawn ideas comparison from technical standpoint.	
	Evaluation	2nd information collection	Evaluate and compare the structured plan.		Decision-making	Decide to pass the drawn ideas to evaluation meeting.
					Abduction	Decide the technically drawn ideas to be the objects to be evaluated in next step.
					Verification	Verify whether the technically drawn ideas have a suitable character for the purpose of FMD or not.
	Full decision-making	Move from 2nd information collection phase to basic matter phase	Decide to proceed the evaluated plan (Issue the order to people)		Evaluation	Create the value by combining each character in drawn ideas from the standpoint of purpose-measure relationship established by FMD
					Decision-making	Judge whether enough evaluation (i.e. value creations are made or not before decision is made).
Abduction					Explain the objective ideas to be selected or decided to concerned people	
Verification					Obtain the opinions before decision is made and adjust the opinions according to FMD.	
				Evaluation	Evaluate (i.e. create the value of) the objective to be decided from standpoint of social needs and get agreement among the concerned people.	
				Decision-making	Decide to proceed the implementation (or making) process of drawn and evaluated ideas.	

Episode 13 Fig. 4

<b>Case to create the intentional future</b>
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	Brief expression	Method of how to	Actual example
Random information	_____	Gather information	Recognition of concept of grade of estimate
Preparations for abduction	What are we going to do with it ?	Find the assumed theme expression by using theme PMD method	
Abduction	Grasp the expression of "Do this", "Will do", "OK to do this", "Must to do"	Establishment of main key word by purpose-measure diagram	In brief, just complete the graduation thesis
Verification	Plan and establish the concrete and structured input and output sequence, and parent and children structure to realize the objective result	Proceed the step working contents of information phase, idea phase, break down structured phase	Structure core of thesis, i.e. the main contents and its algorithm of thesis according assumed theme. (If it is necessary, adjust the expression of theme)
Evaluation	Understand the planned structure of objective and evaluate (I.e. Create the value) the planned structure from standpoint of purpose-measure relationship	Implement the work content which is defined as the work contents for 2nd information phase of steplist management before full decision is made	Evaluate (or create the value the core of theme) of thesis as the valuable graduate thesis
Decision of full scale implementation	Decide whether to proceed to process to materialize the plan and evaluate structure or not	Move from the 2nd information phase to basic matter phase of steplist management phase	Decide to get into process to write the detailed and associated part of graduate thesis
GO-A-HEAD	Implement to materialize the planned structure	Implement the work contents for basic matter, detailed matter and completion phase of steplist management form	Complete the graduate thesis and graduate university
After evaluation	Use the implemented result to be useful for society	Review and proceed corrective action as the review phase work of steplist management frame work	<ul style="list-style-type: none"> <li>· Use and develop the experience and process of the graduate thesis completion (Repeat the value creation)</li> <li>· Think it was the good experience and process of completion of the graduate thesis</li> </ul>