Appendix J

The relationship between QFD, VA/VE and DTCN/DTC methodology

by

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Abstract

Dr.Akao (Professor of Asahi University, Originator of the QFD method) made the following comment in the *Book of Quality Function Deployment* published by the Japan Union of Scientific Institutes. (1978)

He said that the method or procedure for “How to combine QFD and VE?” is not well established yet.

So, there is a need to combine these two methodologies.

This paper is in response to this need, and clears the thinking and procedures of how to combine them by introducing the DTCN/DTC (Design To Customers' Need/Design To Cost) methodology originated by Dr.Esaki, Professor of Asahi University. [1]

Because of limited space in this paper, the methodology relationship is discussed as follows:

(1) Supporting relationship between QFD and DTCN/DTC Methodology.

(2) Supporting relationship between QFD and VA/VE Methodology.

(3) Supporting relationship between QFD, VA/VE and DTCN/DTC Methodology.

(4) Conclusion

1. Supporting relationship between QFD and DTCN/DTC Methodology

Figure 1 shows the amended flow chart of "Total flow of new creative design method in quality planning phase combining QFD and DTCN/DTC methodology" which was published by Dr.Akao and Dr.Esaki at the QFD symposium at Linkoeping, Sweden. (1997) [2]

The amended flow chart is proposed by the author.

The purpose of the amendment is to prepare the faultless questionnaire items for the free answer sheet in QFD.

Here, it says that in order to faultlessly prepare the questionnaire items for the free answer sheet, it is very much recommended to use PMD (Purpose Measure Diagram) method of DTCN/DTC methodology.

This recommendation is located at block no.① in Figure 1.

2. Supporting relationship between QFD and VA/VE Methodology

The QFD method starts from the scene.

The VA/VE method starts from the question "What is it?" and then reduces the cost by raising the value of Function/Cost.

The purpose of both methods is the same: to raise the value.

However, the following features are distinctive characteristics in each method.

(1) The QFD method focuses firstly on the quality which the customer wants, using the expression of function with modifiers on verb and noun expressions, however.

(2) The VA/VE method starts with the expression of function without modifiers on verb and noun expressions.

(3) The QFD method has the method and procedure up to the building of the Planned Quality requirement.

So, the QFD method has to have the down stream method that we can use to create and materialize concrete ideas and measures to realize the Planned Quality requirement.

(4) The VA/VE method is very effective for reviewing and improving the cost and value of existing things or for drawing pictures as visible schemas.

And also creates concrete alternative ideas for improving the value of things.

This is very attractive from the QFD method side, for creating and materializing the Planning Quality requirement.

However, the QFD method starts with the expression of function using modifiers, whereas, VA/VE

starts with expression of function without modifiers.

Because of this conflict, these two methods will obviously not fit each other.

(5) Both the QFD, VA/VE and other methodologies have not cleared the relationship between FTS (Function Tree Structure) and WBS (Work Breakdown Structure) yet, though they look alike.

3. Supporting relationship between QFD, VA/VE and DTCN/DTC methodology

In order to fill the gap between these three methodologies, the following explanation will be easy to understand and effective, using the diagram in the column of "How to combine QFD, VA/VE and DTCN/DTC methodologies" in Figure 2.

(1) In order to materialize the concrete idea for planned quality with the required level of function with modifiers, it is effectively recommended to use the FBS (Function Breakdown Structure) technique of the DTCN/DTC methodology which clears the relationship between WBS and FTS and quickly leads us to "concrete and comparative ideas."

(2) In order to create the most effective and efficient procedure to realize the planned quality, it is recommended to use the Steplist method of the DTCN/DTC methodology which creates the faultless procedure.

(3) In order to strictly review, refine and improve the proposed picturized idea using the VA/VE method, it is very effective to use after picturizing the idea proposed by the QFD method from the scene of customer's usage and need,

(4) In order to pick up the faultless questionnaire items for the free answer sheet of the QFD method, it is very effective to use the PMD (Purpose Measure Diagram) method of the DTCN/DTC methodology.

4. Conclusion

In brief, it is very much recommended to combine the QFD and DTCN/DTC methods rather than combining the QFD and VA/VE methods if necessary.

This combination can effectively realize the planned quality of the QFD method.

In the end, the following miracle encounters of two professors must be understood.

In 1997 Dr.Akao (the originator of the QFD methodology) and Dr.Esaki (the originator of the DTCN/DTC methodology) first met each other when they were assigned as professors of Asahi University by a lucky stroke fortune which was not intended by any person.

So, contents of this paper are re-edited under the guidance and agree with Dr. Akao (QFD method originator) and Dr. Esaki (DTCN/DTC methodology originator) at Asahi University at the date of 2002/2/6.

References:

[1] Esaki, M. "Advanced Project Management Methodology (DTCN/DTC Method)," ASCII publication,1997.

Full contents of this Methodology appear in URL: http://ims-web.asahi-u.ac.jp/ims09/

[2] Akao, Y., Esaki, M., Ueda, N. "New creative design method in quality planning phase by combining QFD and DTCN/DTC methodology," Japanese Union Scientists and Engineers press, The third annual international QFD symposium, Volume 2, p.113, 1997.

Figure 1 Total flow of new creative design method in quality planning phase by combining QFD and DTCN/DTC methodology

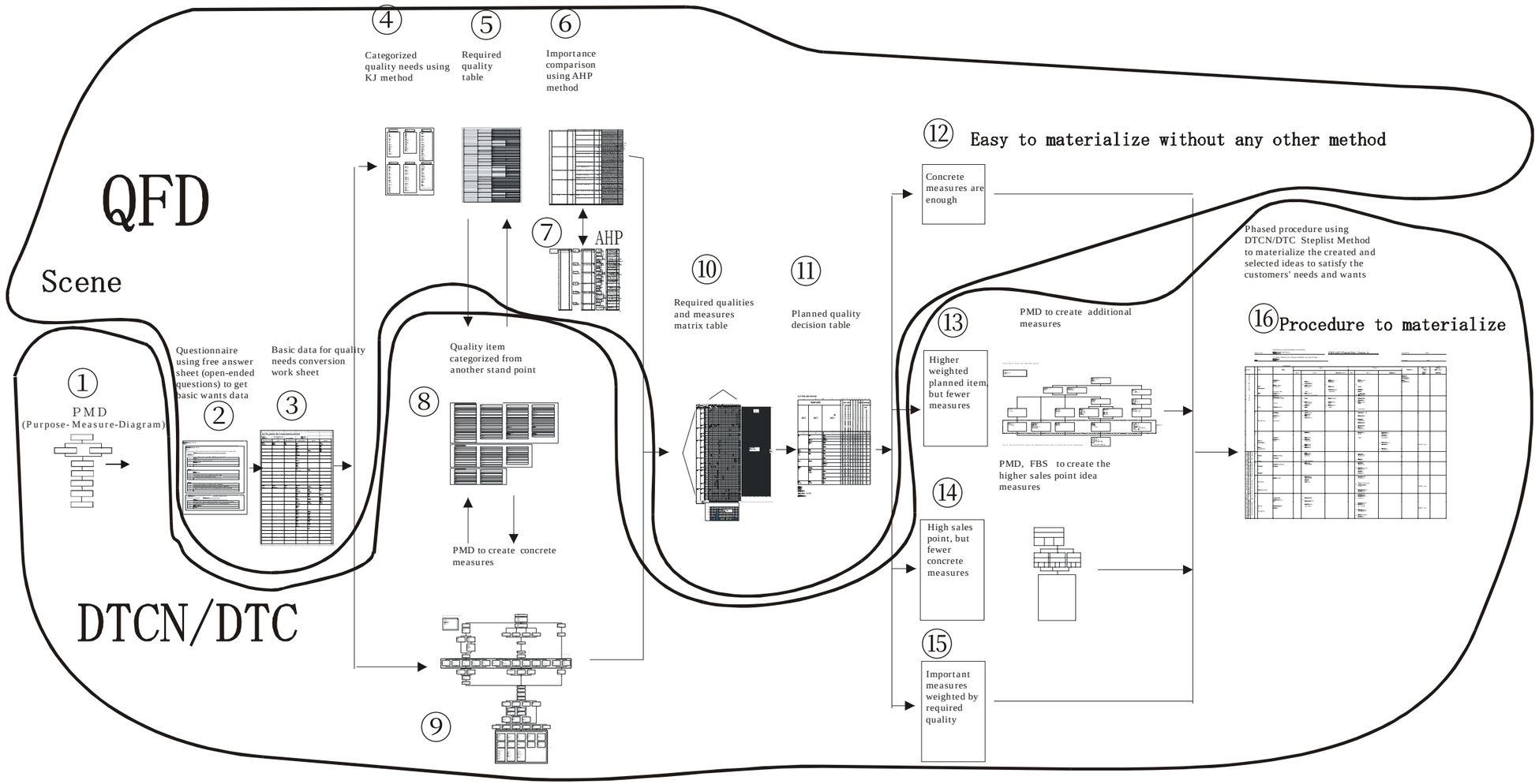
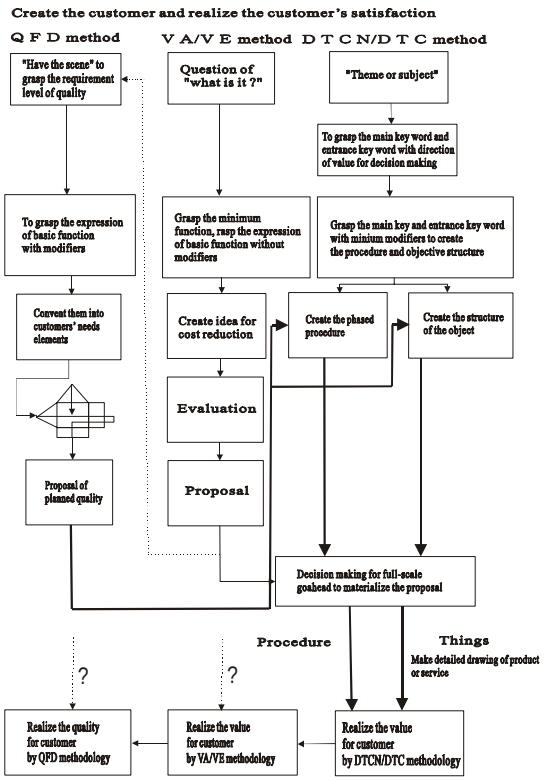


Figure 2　Supporting relationship between QFD, VA/VE and DTCN/DTC methodologies

	A	B	C	D
	QFD method	VA/VE method	DTCN/DTC method	How to combine QFD, VA/VE and DTCN/DTC methodologies
Ⅰ. Purpose of method and features of method	① Purpose: To create the quality plans for products and services and create the measure priorities and desired target value. ② Point of procedure: A. Extract the customers' needs from the scene, and convert them into quality elements, then build up quality planning table to win the competition. B. Create performance measure priorities and desired design target value, using quality planning table to win the competition. Note: The QFD methodology does not have a phased procedure which continues up to the point where the result is realized after proposing the planned quality, performance measure priorities and desired design target value. In the case of the QFD for narrow meaning, it has a value platform to extract customers' needs of the process.	① Purpose: To create higher value, by reducing the cost of products and services while keeping the same basic functions. ② Point of procedure: A. Starting with the question of "What is it?" decide the evaluation cost and function base line with expressions of the most purified basic functions using "verb and noun" expressions with no modifiers. B. Then create alterative ideas or plans to the things or drawings which already exist and which we can see. Then evaluate the alternative idea with the most purified basic function and its cost. The VA/VE methodology does not have a phased procedure up to the point of materialization including a decision-making phase to adopt the proposed alternative idea or plan.	① Purpose: To create value in visible form, and realize it. ② Point of procedure: A. Create a purpose-measure diagram in vertical form and grasp the main keyword. B. Create the faultless phased procedure to realize the objective result, using steplist method. C. Create the most appropriate structure of objective result, using FBS technique. ③ Therefore A. The DTCN/DTC methodology complements the QFD method in the procedure of materializing and realizing the planned quality after proposing the performance measures priorities and desired target value. B. In the case of the QFD for narrow meaning, the DTCN/DTC methodology provides the faultless and phased process to extract the customers' needs in the process of design, manufacturing, service and scrap. C. The DTCN/DTC methodology complements the VA/VE method in the upper stream procedures of the VA/VE method and in the procedure of adopting and materializing the proposed alternative ideas or plans after their proposal.	
Ⅱ. Grasping of the expression of function (verb + noun)	In order to grasp the required quality, use an expression of function customers' language with modifiers (e.g. adjective and adverb)	In order to grasp the expression of the most purified basic function, use an expression of function without modifier.	In order to grasp the procedural functions and also thing's functions to realize the effective objective result for visually established value by using DTCN/DTC method, use the expression of function with minimum or no modifier.	
Ⅲ. Scope of application	1. Any practical scene which can be assumed. 2. The object can be a thing, product, system or any service function.	1. Effective at improving existing things or proposed drawings or plans.	1. Including the matters of the left columns, the DTCN/DTC methodology is effective to create new value and to materialize the created value.	

<table>
<tr>
<td>Ⅳ. To grasp the expression of required quality (function)</td>
<td>① Gather original data starting with the “Questionnaire sheet” using open-ended questions on the scene.
② Using the original data, create the expression of function with modifiers to clarify the required level of function</td>
<td>① Start with the question of “What is it?” to grasp the expression of the most purified basic function with no modifier as a baseline to evaluate and compare alternative ideas.
② Using “Why?” questions, can make it difficult to avoid embarrassing the people responsible for past situations.</td>
<td>① Starting with a theme or subject, establish the visible direction value, main keyword, and entrance keyword in order to realize the effective result.
② Using only “in order to ・・・, how to ・・・” questions, and not using “Why?” questions, no barrier to over come not embarrassing the past mater or responsible people.
③ So, it is very effective to realize new value in any area.</td>
<td>1. QFD proposes the required quality level using a required quality function expression.
2. VA/VE starts with establishing the “F/C=V” evaluation base line with pure function expression.
3. DTCN/DTC methodology uses the expression of function with a minimal number of modifiers to create phased procedures and to realize objective results including a review phase after realization.

Note: Though they are alike. The VA/VE methodology does not clear the relationship between WBS (Work Breakdown Structure) and function tree structure. On the other hand, the DTCN/DTC methodology clearly explains the relationship.</td>
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<tr>
<td>Ⅴ. Procedure to realize the objective result</td>
<td>After proposing a planned quality, it is effective to use the DTCN/DTC phased procedure, “Steplist” and to structure the planned quality using the “FBS (Function Breakdown Structure) technique.
<table>
<tr><td>1</td><td>Queationnaire using free answer sheet (open-ended questions)</td></tr>
<tr><td>2</td><td>Obtain basic data</td></tr>
<tr><td>3</td><td>Group them using KJ method</td></tr>
<tr><td>4</td><td>Make customers' needs table</td></tr>
<tr><td>5</td><td>Create Pre-pre-plan of quality plannig tabe, comparing with own product or service and competive suppliers' ones</td></tr>
<tr><td>6</td><td>Extrct performance measures from customers' needs table</td></tr>
<tr><td>7</td><td>Group them using KJ method</td></tr>
<tr><td>8</td><td>Make performance measure table</td></tr>
<tr><td>9</td><td>Make a matrix table with customers' needs table and performance measure table</td></tr>
<tr><td>10</td><td>Enter the weighted relationships in the matrix table</td></tr>
<tr><td>11</td><td>Copmplete the quality planning table, comparing with competitiors' products or services and own ones</td></tr>
<tr><td>12</td><td>Decide the measure priorities and desired design qualty target value, by using quality planning table and performance measure table with comparing copetitive supplyers' ones</td></tr>
</table>
↓
After this the very vague procedure is shown to realize the planned quality, as a resulted matter.</td>
<td>① The procedure up to the proposal stage is shown below, though it can tailor as necessary.
② Use the VA/VE to create the alternative idea to reduce the basic cost as strict review method after picturizing the QFD proposal.
③ The relationship between FTS (Function Tree Structure) and WBS (Work Breakdown structure) is not clearly explained, though they are alike.
<table>
<tr><td rowspan="2">1.Definition of function</td><td>(1)What is this?</td></tr>
<tr><td>(2)What is its function ?</td></tr>
<tr><td rowspan="2">2.Evaluation of function</td><td>(3)How much does it cost?</td></tr>
<tr><td>(4)What is its value?</td></tr>
<tr><td rowspan="3">3.Create alternative</td><td>(5)Find another one which has the same function?</td></tr>
<tr><td>(6)How much does it cost?</td></tr>
<tr><td>(7)Does it realize the required function function exactly?</td></tr>
<tr><td>4.Proposal of alternative idea or plan</td><td>Propose the best alternative. If alternative was not adopted, it is the end of the line.</td></tr>
</table>
↓
After this the very vague procedure is shown to realize the result of proposed idea.</td>
<td>① Make specific phase procedures using the “Steplist” method.
② It is recommended to proceed with the QFD and the DTCN/DTC so that they can optimize each other, having an interactive action.
③ The DTCN/DTC method is effective for creating faultless and phased procedures and for picking up the required job quality for QFD analysis.
④ The relationship between FTS (Function Tree Structure) and WBS (Work Breakdown structure) is clearly defined by FBS (Function Breakdown Structure) technique in DTCN methodology.
Theme _____.
Keyword (　　) with direction of value by PMD
<table>
<tr><td rowspan="4">Inductive approach</td><td>1</td><td>1st Information collecting</td></tr>
<tr><td>2</td><td>Basic concept</td></tr>
<tr><td>3</td><td>Structure</td></tr>
<tr><td>4</td><td>Evaluation & decision at non-return point</td></tr>
<tr><td rowspan="4">Deductive approach</td><td>5</td><td>Basic matter or design</td></tr>
<tr><td>6</td><td>Detailed matter or design</td></tr>
<tr><td>7</td><td>Implementation to get result</td></tr>
<tr><td>8</td><td>Review</td></tr>
</table>
⑤ In order to reduce the cost and increase the quality, use this method parallel with QFD, and optimize the idea.. To organize the procedure to do this, DTCN/DTC methodology is very effective</td>
<td>
<table>
<tr><td>QFD method</td><td>VA/VE method</td><td>DTCN/DTC method</td></tr>
<tr><td>“The output of QFD” is the planned quality to win among the competitors.</td><td>“The output of VA/VE is the alternative proposal to increase value and reduce cost.</td><td>“The output of DTCN/DTC” is the effective objective result for created value.</td></tr>
</table>
These three methodologies support each other.
Depending upon the product/system and its life cycle phase and what we want to realize, in order to effectively use the QFD and the VA/VE methods, the DTCN/DTC method can be used to create the most appropriate phased procedure and allocate them in the relationship of input and output for each methodology.
This is because that any methodology must prepare the appropriate input effectively to use that methodology.
The DTCN/DTC methodology can create the phased procedure how to create that input.
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