The Method for Motivation by Quality Function Deployment (QFD)

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ABSTRACT

This paper presented a study on proposing a method for motivation with the use of QFD. It was reported by three students who majored in MOT at Graduate School of Science and Engineering, Yamagata University in 2009. QFD has been widely used in manufacture and service industries for making improvement with the existing products and programs. However, in this study, QFD was not used in the sense of "activation" to improve motivation. Rather, it took the viewpoint of "what is required by customers", the central theme QFD, to approach the problem. With reference to the process of knowledge conversion suggested by the SECI Model, the study operated with the basic principles and steps of QFD. In the paper, the major steps of QFD leading to setting quality planning were outlined and the implication of the study was discussed.

Keywords: Quality function deployment, QFD, motivation, quality of life

1.0 Introduction

Quality function deployment (QFD) can be described as a methodology that makes every process of product development transparent, starting from understanding the qualities demanded by customers all the way down to establishing quality planning and determining design quality (1-9).

Product quality is built with many elements, including functional parts, components, manufacturing processes, and so on. No single human being is capable of managing all of these alone, so QFD empowers us to gain control over the critical points of such a vast network of quality. By making the critical areas of the development process transparent, the safety of a product can be assured, various problems can be prevented from materializing, thorough control and management become possible, and a perfect product can be provided to consumers.

Motivation is also like this – a vast network of quality that made up of a lot of elements. In this study, the problem of motivation was approached from viewpoint of "what is required by customers". Using QFD to identify the critical points of the vast network of quality of motivation, improvement could be made easily.

2.0 QFD and SECI Model

In last March, the author published a new book called "Quality Function Deployment – Knowledge Conversion of SECI Model and QFD". Professor Ikujiro Nonaka et al. proposed a theory on the conversion from tacit knowledge into explicit knowledge for product development. By going through four phases, namely, (1) Socialization (tacit to tacit), (2) Externalization (tacit to explicit), (3) Combination (explicit to explicit), and, (4) Internalization (explicit to tacit), new knowledge could be created from the process (10). However, the concept corresponding to tacit and explicit knowledge has been widely applied in the QFD community for over 40 years. Specific methods have long been established and used in new product development. Figure 1 illustrates the linkage between QFD and

SECI Model (11). This paper will show the creation of new knowledge that proposed SECI Model for doing motivation with using QFD.

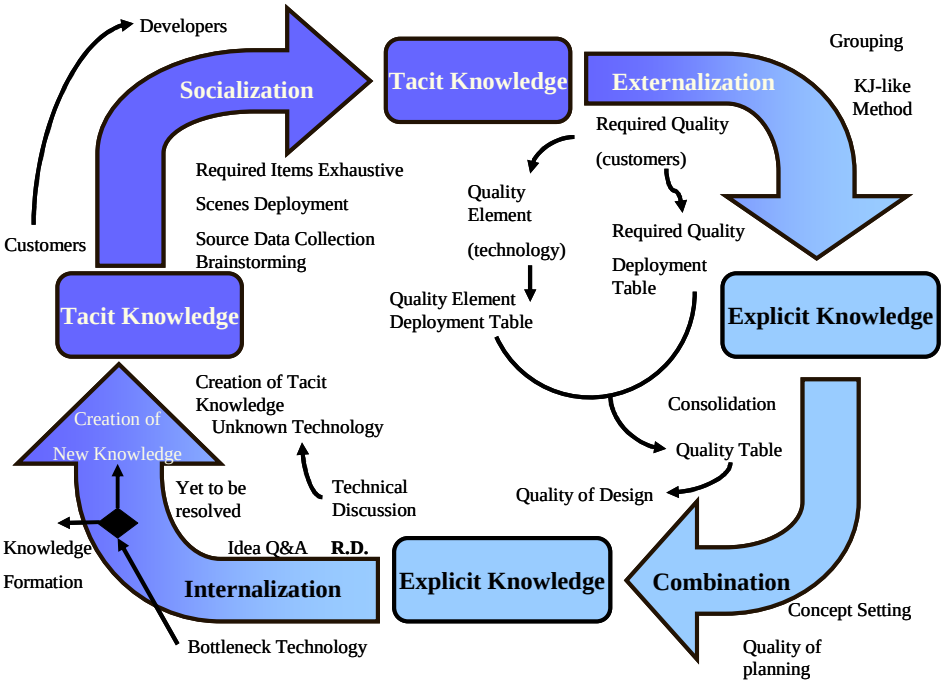

Figure 1: QFD and SEC1 Model

3.0 The Study

The company conducted the study was one that has been seeking methods for doing motivation. For establishing quality planning, the development team had included three other companies into the study for comparison purpose. Below are the details of the companies:

	Company	Image
Own Company	A	Not only actively seeking methods for motivation but individuals were also offered with activities for keeping motivated.
Other Companies	B	B is the celebrity and profitable in industry. It mainly offered many kinds of themed motivation training courses.
	C	C mainly offered correspondence coaching using e-learning and mail.
	D	D had training for company on motivation education for business.

Table 1: Information of the companies of the study

3.1 Extraction of Demanded Quality

The voice of the customer (VOC) was collected with using the scene deployment method. Different scenes from daily life were explored to capture raw data. For each scene, demanded items were first extracted and consequently turned into demanded qualities. For example, the original datum of "Have smile appearance" was related to the scenes of "When I do my job" and "When eating delicious food". For the scene of "When I do my job", demanded items of "Design power" and "Driving power" were extracted. The demanded item of "Design power" was further translated into the demanded quality of "Possess many ideas". As demanded items may contain expressions other than customer requirements, it is necessary to complete the extraction of demanded qualities from one demanded item before move on to next demanded item. Table 2 shows the process of converting the VOC into demanded qualities.

Original data	Scene WHO WHERE WHEN	Demanded Item	Demanded quality
Have smile appearance	When I do my job	Design power	Possess many ideas
		Driving power	Have performance
		Have communication skill	Have communication skill
	When eating delicious food	Can be able to take rest	Have safety
		With friends	
		Can be able to relax	Have relax
Last long	When candidates study for test	Keep concentration	Can keep power of concentration
		Good efficiency	Can keep good efficiency
		Do not feel tired	Last long
Advance my job	When job finished earlier than plan	Have a plan	Have a plan
		Good preparation	Can be able to prepare
		Have an image	Have an image
Keep healthy	When life is stressful	Collect information	Collect information
		Release stress	Release stress
		Overcome rivalry in life	Make a religion
		Have self-control power	Make a religion
Be cheerful	When hum to oneself	Positive mind	Have positive mind
		Good condition	Have a health control

Table 2: Data conversion from VOC into demanded qualities using scene deployment method

This is the first phase of the SECI Model. The tacit knowledge about customer requirements is still in the form of tacit knowledge. Knowledge transformation has not yet been taken place.

3.2 Setting Demanded Quality Deployment Table

The demanded qualities were organized by putting them into groups using the KJ Method (or affinity diagramming). The items were first grouped up from the 3rd level into the 2nd level. For example, four demanded quality items at the 3rd level, namely "Have achievement", "Have satisfaction", "Have response" and "Have fulfillment", were put into a group at the 2nd level named as "Can provide mental joy". Figure 2 shows the grouping process.

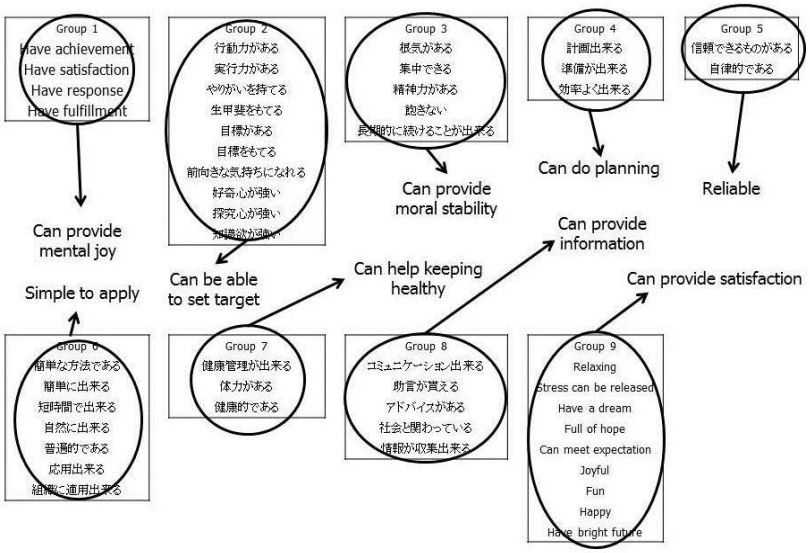

Figure 2: Demanded quality items at 3rd level were grouped up to 2nd level

The items at 2nd level were further grouped up to 1st level, again, using the KJ Method. For example, the two items at the 2nd level, namely, "Can provide mental joy" and "Can provide satisfaction", were grouped up to 1st level with the name of "Can provide mental reward". Figure 3 exhibits the result of the grouping.

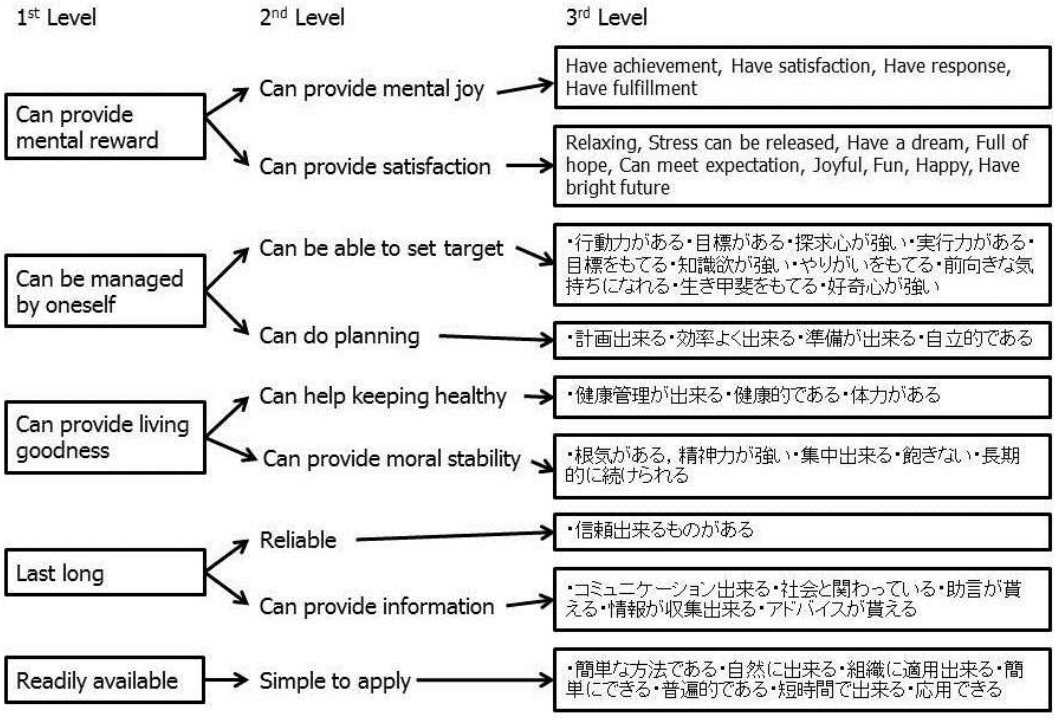

Figure 3: Demanded quality items were organized into 1st, 2nd and 3rd levels

The purpose of grouping the demanded quality items was to put them into a hierarchy, or, a ladder of abstraction. The degree of concreteness increases from 3rd level to 1st level of the ladder. Figure 4 shows an example of one of the groups.

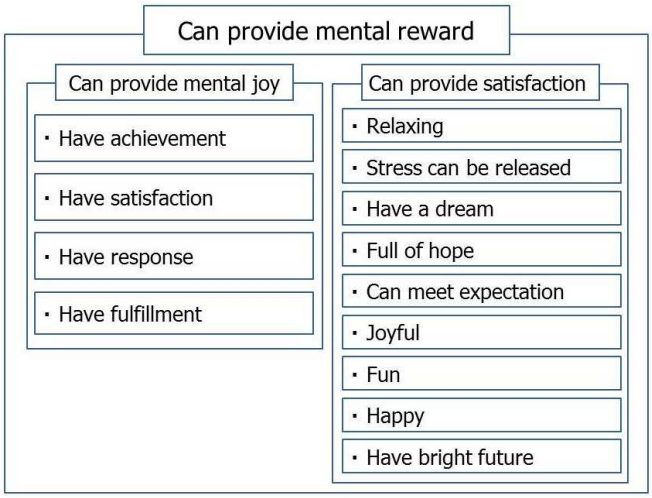

Figure 4: An example of demanded quality in hierarchical form

Through this organizing process, the tacit knowledge has become transparent. This is the second phase of the SECI Model in which the tacit knowledge is transformed into explicit knowledge. The knowledge is ready to use now.

3.3 Computation of Demanded Quality Weights

Analytic hierarchy process (AHP) was used to determine the degree of importance for each of the demanded qualities at the 2nd level. Below is the scale used to do the pairwise comparison of AHP:

1 – Indicates the former and the latter are "equally important"
3 – Indicates the former is "moderately more important" than the latter
5 – Indicates the former is "strongly more important" than the latter
7 – Indicates the former is "very strongly more important" than the latter
9 – Indicates the former is "extremely more important" than the latter

Computation starts at the 1st level. The five demanded qualities at the 1st level were put into the AHP grid. Comparison on the importance to customers was made for each pair of the five demanded qualities. For example, "3" was assigned to the comparison of "Can provide mental reward" with "Can be managed by oneself", which indicated that "Can provide mental reward" was moderately more important than "Can be managed by oneself". Equally, "1/3" was assigned to the comparison of "Can be managed by oneself" with "Can provide mental reward", indicating that "Can be managed by oneself" was moderately less important than "Can provide mental reward". Table 3 exhibits the weights of importance of the five demanded qualities at the 1st level.

	Can provide mental reward	Can be managed by oneself	Can provide living goodness	Last long	Readily available	Geometric Mean	Weight
Can provide mental reward	1	3	1	3	5	2.14	0.253
Can be managed by oneself	1/3	1	3	3	7	2.81	0.333
Can provide living goodness	1	1/3	1	1	5	1.49	0.176
Last long	1/3	1/3	1	1	1	1	0.118
Readily available	1/5	1/7	1/5	1	1	1	0.118
						8.45	1.000

Table 3: Weights of importance of the five demanded qualities at the 1st level

Computation continued to the 2nd level. Items included in each of the five demanded qualities were put into the AHP grid. Comparison on the importance to customers was made for each pair of the included items. Table 3 exhibits the weights of importance of the items at the 2nd level of the demanded quality of "Last long".

	Reliable	Can provide information	Results can be realized	Geometric Mean	Weight
Reliable	1	1/3	1/9	1.00	0.174
Can provide information	3	1	1/3	1.73	0.302
Results can be realized	9	3	1	3.00	0.523
				5.73	1.000

Table 4: Weights of importance of the items at the 2nd level of the demanded quality of "Last long"

The global weight of importance for each item at the 2nd level was obtained by multiplying its local weight with the weight of the group at the 1st level to which it belongs. For example, the global weight of importance for the demanded quality of "Can provide mental joy" is 0.253 x 0.432 = 0.109. Table 5 displays the weights of importance for the demanded quality items at the 2nd level.

1st Level	1st Level Weight	2nd Level	2nd Level Weight	1st Level x 2nd Level
Can provide mental reward	0.253	Can provide mental joy	0.432	0.109
		Can provide satisfaction	0.207	0.052
		Can meet expectation	0.359	0.091
Can be managed by oneself	0.333	Can be able to set target	0.530	0.176
		Can do planning	0.145	0.048
		Can raise morale	0.324	0.108
Can provide living goodness	0.176	Can keep power of concentration	0.572	0.101
		Can keep healthy	0.270	0.047
		Can provide morale stability	0.156	0.027
Last long	0.118	Reliable	0.174	0.020
		Can provide information	0.302	0.035
		Results can be realized	0.523	0.061
Readily available	0.118	Simple	0.75	0.088
		Easy to apply	0.25	0.029

Table 5: Weights of importance for the demanded quality items at the 2nd level

3.4 Setting Planned Quality

After determining the degree of importance for the demanded qualities, the team moved on to setting the planned quality. With reference to the importance to customers and benchmarking the performance of own company to other companies, the team set the planned quality level for each demanded quality item. For example, as the demanded quality item of "Can be able to set target" was very important to customers (17.68), the team thus set the planned quality level at 5. Another example was the demanded quality item of "Simple". The team set the planned quality level at 4 in regard to the fact that the performance of other companies was generally low. If improvement could be made to this item, then it would greatly increase customer satisfaction.

To bring the company's performance to the level of the planned quality, level-up ratio, or improvement rate, for each demanded quality item has to be calculated. For the demanded quality item of "Can provide mental joy", the performance of own company was 3 and the planned quality level was 4, the level-up ratio was 4/3 = 1.33.

After calculating the level-up ratio, the team determined the sales point for each demanded quality item using the ratings of ◎=1.5 & ○=1.2. For example, the sales point for the demanded quality of "Can be able to set target" was set at 1.5. It was because the development team found that not only this demanded quality was very important to the customers but the planned quality was also set at level 5. This demanded quality would be important to sales.

The absolute weight of each demanded quality item was calculated by: weight of importance to customers x level-up ratio x sales point. For example, the absolute weight of the demanded quality item of "Can be able to set target" was 17.68 x 1.25 x 1.5 = 33.16, and, its final weight was 33.16/153.38 = 21.62.

Table 6 exhibits the completed quality planning table. From the table, three important demanded qualities were identified: (1) "Can be able to set target" (21.62), (2) "Can raise morale" (10.57), and, (3) "Simple"

(9.25). These three demanded qualities would be deployed into quality elements to design the motivation program.

Demand Quality Deployment Table					Planned Quality								
					Comparative				Plan			Weight	
					Own Co.	Others			Planned Quality	Level up ratio	Sales point	Absolute Weight.	Demanded Quality Weight
						A	B	C					
1st Level	1st Level Weight	2nd Level	2nd Level Weight	1st x 2nd									
Can provide mental reward	0.253	Can provide mental joy	0.432	10.94	3	3	3	3	4	1.33		14.60	9.52
		Can provide satisfaction	0.207	5.26	3	3	3	3	3	1.00		5.26	3.43
		Can meet expectation	0.359	9.11	3	4	3	3	4	1.33		12.15	7.92
Can be managed by oneself	0.333	Can be able to set target	0.530	17.68	4	4	4	3	5	1.25	◎	33.16	21.62
		Can do planning	0.145	4.83	3	4	4	3	5	1.67	◎	12.08	7.88
		Can raise morale	0.324	10.80	4	4	3	3	5	1.25	○	16.21	10.57
Can provide living goodness	0.176	Can keep power of concentration	0.572	10.12	3	3	4	3	4	1.33		13.50	8.80
		Can keep healthy	0.270	4.79	3	3	3	3	3	1.00		4.79	3.13
		Can provide morale stability	0.156	2.76	3	3	3	3	5	1.67	◎	6.92	4.51
Last long	0.118	Reliable	0.174	2.06	3	3	3	3	4	1.33		2.75	1.79
		Can provide information	0.302	3.57	3	4	4	3	4	1.33		4.77	3.11
		Results can be realized	0.523	6.19	3	3	3	3	4	1.33		8.25	5.38
Readily available	0.118	Simple	0.750	8.87	3	2	2	2	4	1.33	○	14.19	9.25
		Easy to apply	0.250	2.95	3	3	3	3	4	1.33	○	4.73	3.08
											合計	153.38	

Table 6: Completed quality planned table

The findings obtained from quality planning should be presented in development meetings so as to make the process transparent. Not only it could allow people for thorough discussion but also could bring everybody's knowledge together. This is the third phase of the SECI Model. The explicit knowledge remains as explicit knowledge but becomes transparent. It is ready to be used for the fourth phase of internalization to create new knowledge (Akao, 2008).

4.0 Conclusion

The study showed the use of QFD to develop motivation programs. It illustrated a simple method that could be used to achieve two important points of motivation:
(1) Since demanded qualities were drawn from many aspects, including work, study and daily life, goal setting therefore was greatly supported.
(2) Work towards goal gives impetus to start every day enthusiastically.

They start with the viewpoint of "what is required by customers" is important to improve the quality of motivation programs.

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Author's Background

Prof. Yoji Akao *is the Visiting Professor at the Graduate School of Business Administration, Yamagata University, Japan. Along with the late Prof. Shigeru Mizuno, Prof. Akao is the founder of QFD. As far back as the 1960s, he was exploring ways to apply powerful Japanese problem solving algorithms to designing products right the first time. Initially using a fishbone diagram, his more complex analyses led to a matrix to identify the design elements which would impact customer satisfaction the greatest. Prof. Akao received the Deming Prize for Individuals in 1978, Distinguished Service Medal from the American Society for Quality in 2001, APBEST Award in 2006, Shainin Medal of American Society for Quality in 2007, Ishikawa-Kano Award of ANQ in 2010, and, awarded JSQC Honorary Member in 1999, ASQ and IAQ Honorary Members in 2010 as well.*