

THE RELATIONSHIP QUALITY - COST EVIDENCED BY THE INTERFERENCE OF QUALITY FUNCTION DEPLOYMENT AND VALUE ANALYSIS

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Abstract: The paper herein presents the two methods currently integrated in the approach to obtaining quality products: value analysis (VA) method and Quality Function Deployment (QFD) method. There are highlighted the similarities between these two methods and how QFD interferes with the VA method. It is also proposed an approach model for process design / redesign of the product value by combining specific elements of the two methods.

1. INTRODUCTION

Classical perception upon quality aims at improving existing products and processes, starting from highlighting the problems occurring during the processes of product transformation, assembly and delivery. In time, the approaches in the field of quality have evolved so that, ever since the year 1960 Japan has extended the traditional approach within the field of quality, in two directions:

- continuous improvement
- quality function development (QFD).

Of our days, modern approach in the field of quality [6, 7] aims at constantly and continuously improving every process of planning, production and service, actions of searching for opportunities outside the organization, in order to add value to the product and, to an equal extent, to the organization.

The method *Quality Function Deployment* (QFD) especially orients the above mentioned improvement efforts to new products and services, although it may also be applied to existing products and services.

The main target of the QFD method is satisfying the user's requirements in all stages of the product trajectory. This target is reached through systematically approaching the process of planning the quality of the new products, the way it is defined by the final user, but also through improving the process of developing new products, through reconsidering the functional relations existing among the departments which participate in realizing the products, under the aspect of observing the delivery terms, the conformity with specified requirements.

The original conceptual model of QFD developed by Yoji Akao [1] and presented in figure 1 suggests the modalities for approaching QFD.

Initially [6], the method of value analysis was defined as organized procedure for identifying futile costs. Subsequently, value analysis was envisaged as method of systemic and creative research & design that, through functional approach, aims at the product functions being designed and achieved with minimal expenses and satisfying the users' necessities.

The principal target of the value analysis method is the one of orienting the process of designing new products or re-designing existing products towards finding constructive solutions that should materialize (through sub-assemblies, components, the product itself) the requirements, on an adequate level from technical and also economic standpoint.

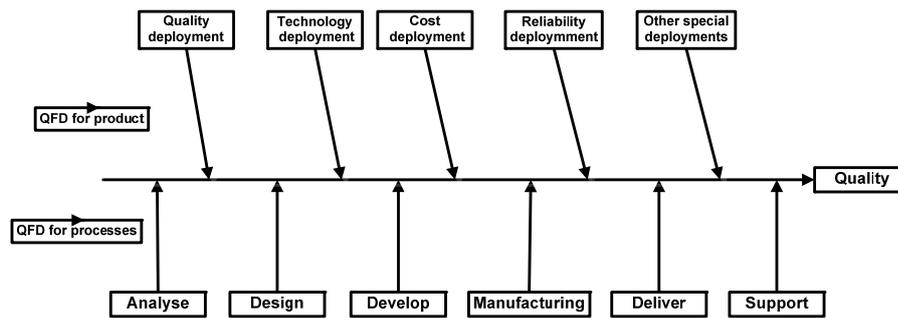


Fig. 1 Comprehensive QFD [Source: Source: Akao, 1990]

In value analysis, the product is dealt with (figure 2) starting from the users' necessities, which are transformed through specific mechanisms in functions (utilities) of the product. The value of the final product is the result yielded by the ratio: measured performances / cost necessary for attaining performance.

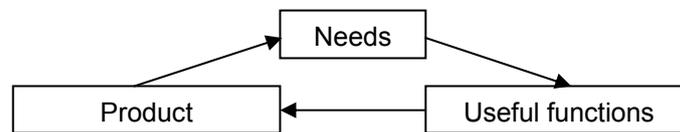


Fig. 2 Product approach in value analysis

In other words, the method of value analysis aims at designing / redesigning products in the spirit of value, within the context in which it is defined:

$$\text{Value of the product} = \text{Quality} / \text{Cost}$$

2. INTERFERECE BETWEEN QUALITY FUNCTION DEPLOYMENT AND VALUE ANALYSIS

In the specialized literature [2] there is spoken of developing the method of value analysis through the method QFD, so as to obtain supplementary effects towards attaining the product quality. Other authors [7] claim that QFD method is but the Japanese variant of Milles' method.

In table 1, a comparison is shown, between the method of value analysis and QFD method.

Comparison between the method of value analysis and QFD method

Table 1

Specific elements	Method of Value Analysis	QFD method
Stage wherein it is used	In the stage of product design or re-design	In all stages of the product life cycle
Purpose	Satisfying the users' requirements at minimal costs. Or, Satisfying the final user at maximal value	
Team	Multidisciplinary: design engineers, production engineers, process engineers, economists, experts in marketing, quality etc.	
Main stages	Analysis on social necessity Analysis on existing situation Design / Re-design of the product Evaluation of the solutions, choice and approval of the optimal solution and control upon application	Analysis on users' needs Determining the quality characteristics Assessing the interactions Comparative analysis of the product
Product structure	Functions and sub-assemblies	Quality functions and characteristics
Prevailing	Of engineering	Of management

actions	
Instruments used in the approach	Functional analysis (FAST), identifying the functions with decision trees, SWOT analysis, Benchmarking, Design for assembly, FMEA etc.

3. MODEL FOR APPROACHING THE DESIGN / RE-DESIGN OF THE PRODUCT VALUE

The approach for obtaining the product value supposes to consider both attaining quality (fraction numerator) on the level required by the users, concomitantly with pursuing and optimizing the costs necessary for obtaining quality. The two methods mentioned above, through their specific instruments and methodologies, concur to reaching to the above target.

The certification that in the product only useful functions will exist, which should reveal the required performances, is provided by the use of the QFD method.

Both for new and existing products, the QFD method suppose analyzing the user's requirements (voice of customer).

Analyzing the voice of customer is achieved resorting to a series of instruments (Voice of Customer, affinity diagram, demand quality hierarchy tree) with whose help there is discovered what the user really wants and not what the producer thinks he expects. The information (ideas) proceeding from the marketing researches, or from other sources are afterwards structured, selected, placed into the hierarchy of the so-called quality requirements.

The previously structured requirements may be qualitatively expressed or fuzzy. They will be subsequently transformed into measurable elements of design, which may be replaced with target specifications. These are the quality characteristics.

The graphical support used in QFD, the house of quality, is a special matrix whose specific parts contain information referring to:

- transforming the quality requirements into quality characteristics;
- assessing the quality requirements through determining the relative importance for every one. The purpose of determining the relative importance is to orient the activities for subsequent improvement on those „areas” that are of the highest importance for the user;
- determining the intensity of the relations between every quality requirement and quality characteristic;
- comparatively analyzing the product with the competition products;
- determining the levels of the quality characteristics, considering the levels set by competition.

In the process of designing the product value, up to this point, QFD settles the following:

- which are the user's explicit requirements, expressed in measurable quality characteristics;
- the level of the quality characteristics referring to the competition; These limits will serve as reference values (limits) in the approach of technically dimensioning the functions of the new product;
- it transforms the quality characteristics into design specifications.

Afterwards, the process of designing the product value supposes settling the product functions. This approach is common for the two methods, in QFD it is called Function Deployment, in VA it is called functional analysis. Unlike QFD, through whom there are only settled the functions, the VA approach also supposes determining the relation between the function contributions to achieving utility and the cost necessary for obtaining the functions [3, 4]. Subsequently, the VA approach supposes designing a product alternative that should fulfill, to an equal extent, the criteria: cost – performance.

The scheme in figure 3 suggests, in a simplified manner, the model of approach of the process of design / redesign of the product value, emphasizing at the same time the interferences between the two methods.

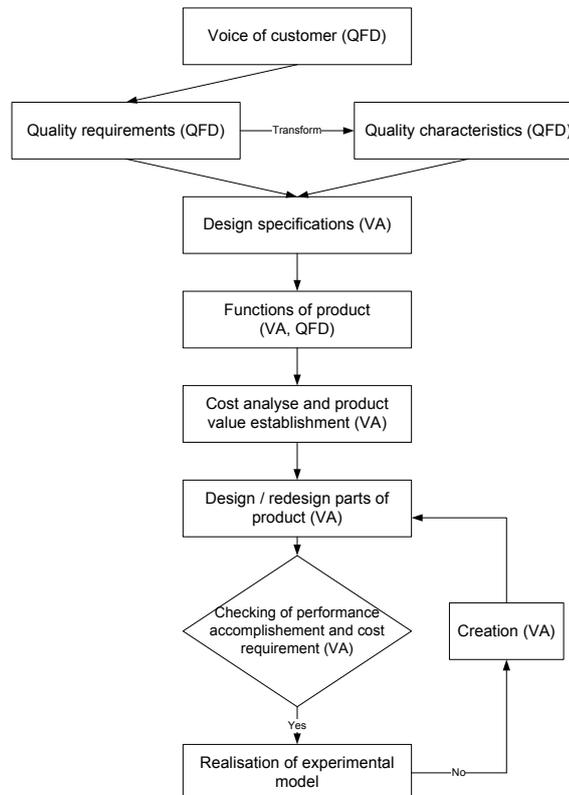


Fig. 3 Design/redesign value product's proces approach

4. CONCLUSIONS

Following the facts submitted above, we conclude that the two methods may be deemed as component parts of the process of conceiving the product value.

This way, through QFD the development of the desired product is ensured – correct from the standpoint of the users' requirements; and through value analysis, its design and manufacturing is ensured, through materializing the characteristics selected and developed in the framework of QFD, in an efficient manner, as there is also considered the cost necessary for materializing the characteristics.

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