

## MANAGEMENT METHODS USED IN THE PROCESS OF PRODUCT QUALITY ACCOMPLISHMENT

Georgiana LIMBĂȘAN<sup>1</sup>

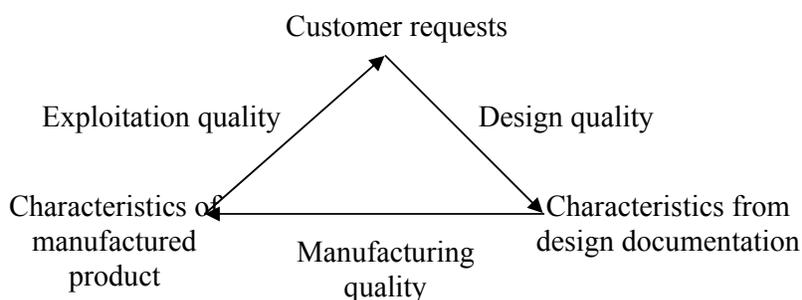
<sup>1</sup>University TRANSILVANIA of Brașov, Department of Economical Engineering and Manufacturing Systems  
e-mail: limbasan.g@unitbv.ro

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**Abstract:** The need for manufacturing products that respond as well as possible to demands underlines the importance presently given to preliminary studies, quality planning and product designing. On the other hand, organisations are looking for solutions by means of which they can manufacture the required products in such a way that their aptitudes are accomplished at low costs. In this way, modern research-design technologies promote the principle of incipient quality, and the two complementary methods presented in the paper, by the way they approach and solve the problems, contribute to the accomplishment of product quality.

### 1. INTRODUCTION

Quality represents the degree in which the amount of intrinsic characteristics of a product fulfills requirements. Irrespective the domain, the manufacturers attempt to distinguish themselves from the competition by means of quality products or services. The difference in front of competition is made by means of product performances and also in terms of delivery terms, prices, and payment terms convenient for the customers or beneficiaries. The quality of the product, appreciated by the beneficiaries, as a last element in the chain of the value created, depends on all the stages the product goes through: conception, fabrication, exploitation (Fig. 1).



**Fig. 1 The triangle of quality (Source: Popescu, M., 2001)**

To these stages there are different stages of quality accomplishment corresponding to each, reflecting the way in which the fulfilment of customer requirements in designing, manufacturing and exploitation are assured [5]. According to ISO 9000 standards, quality results from the definition of needs which refer to the product and is to be found in the preliminary specifications and in conception quality.

Conception quality represents the degree in which the characteristics in the designing documentation are identical to the preliminary specifications. Fabrication quality aims at the transformation of previously defined characteristics, by means of specific processes in conditions of efficiency into (technical- functional, economical, ergonomically, environmental) characteristics of the manufactured product. Exploitation quality, by means

of the levels achieved by the established indicators and characteristics confirms the fact that the products fulfil the requirements.

Product quality accomplishment implies: the identification of processes and the creation of some adequate structures able to favour [4, 5]:

- a. The knowledge of customer requirements;
- b. Customer satisfaction in terms of efficiency;
- c. Continuous improvement of processes;

Taking into consideration the organisatory aspect, the structures that respond to the previously mentioned requirements are those based on the principles of flexible organisation, whose main coordinators are:

- The replacement of those compartments specialised on functions or parts of functions with cross-functional teams.
- The reduction of the vertical dimension of the organisation- due to its redistribution in compartments, the hierarchical organisational structures become flat [3].

Considering the technical-operational aspect, the accomplishment of product quality implies systematic actions that aim at the integration of adequate resources and independent activities within the organisation. In other words the processes of the organisation are those that have to be identified and defined correctly in order to turn input data (implicit and explicit requirements of the customers, materials, energy, information) into output data (material or immaterial products).

## **2. QUALITY FUNCTION DEPLOYMENT – METHOD USED FOR PRODUCT CONCEPTION QUALITY PLANNING AND ACCOMPLISHMENT**

Product quality planning requires the following stages:

- a. The identification and establishing of customers' needs;
- b. The establishing of product quality characteristics that take into account necessities and the elaboration of technical specifications;
- c. The establishing of components' characteristics;
- d. The designing and organisation of execution processes: manufacturing, assembly, monitoring/ measuring, able to fulfil the designed characteristics and verify the concordance of production with quality objectives.

The identification of quality requirements is in this way is one of the stages of the planning process in the accomplishment of product quality. The requirements for quality refer both to the explicit needs (contractual) and implicit (non-contractual) of the customers, as well as to the requirements of society, by means of obligations that aim at people safety and environment protection [6].

The Quality Function Deployment (QFD) method is a method that found a large applicability in Japan, USA, Western Europe, and its use being connected to the modern approach of quality – quality management [1].

The Quality Function Deployment (QFD) method, as it was defined by Akao and Mizuro in 1960, has two components. The first component aims at the obtaining of quality in the case of new products by means of turning customer needs into designing characteristics and their systematic development in manufacturing. The second component of the method [1] is centred on the business processes of the organisation, assuring the fact that all processes, functions and activities done by the employees take place in such a way that quality is assured.

QFD uses, as a graphic support, a special diagram called the "House of Quality". Central to the QFD method is the conversion of the voice of customer as represented by

Demanded Quality into the voice of engineer, as represented by the Quality Characteristics. This is handled through a special matrix called the House of Quality.

The accomplishment of the „house of quality” involves several steps:

1. The definition of demanded quality. Customers' requirements are grouped, structured and placed in a hierarchy. These are situated on the vertical axis of the diagram.

2. The listing of product final characteristics in accordance with the requirements. The characteristics are expressed in measurable terms in order to be easily controlled and compared to norm levels. The characteristics are also established taking into account the way in which the processes of designing, fabrication/ manufacturing, assembly, service, determine the final performances of the product.

3. The study of the relationship between the customers' requirements and the control characteristics of the final product. In this sense there are used symbols that allow for the identification of these relationships. In this way it is pointed out the risk that designers might not be aware of some requirements expressed by the customer. In this case there will be completed or modified the control characteristics of the final product in such a way that all the customer's characteristics are accomplished.

4. The establishing of the relative importance of each and every of the listed requirements and the evaluation of the existing products competitiveness. The importance coefficients help establishing the first important directions for the improvement of the product. The evaluation of competitiveness refers to the way in which the product is regarded by the customers and their relationship with the competition.

5. The establishing of quality characteristics a product must possess. In order to obtain the data there are tests and evaluations done by the organisation for their own products but also for the products belonging to competition.

The development of QFD implies that all the characteristics that are important for the beneficiary customer or those determined as important in the sell of the product must be expressed by requirements, actions or control operations in such a way that the customer's can be found all along the development process and continued in manufacturing, marketing and merchandising.

In this way, by going through these stages, the analysis of the product is accomplished, starting with its designing, moving on to the manufacturing stage and ending with the checking of execution quality.

As a consequence of the application of the method there are created the premises for the creation of an improved product, taking into account the fulfilment of customer needs and the difficulties encountered by the organisation in order to accomplish the required characteristics.

### **3. VALUE ANALYSIS – PRODUCT QUALITY DESIGN- REDESIGN METHOD**

According to the French norm NF X50-150, value analysis is a competitive, organised and creative method that aims at fulfilling customer needs by means of a specific conception process which is at the same time functional, economic and cross-disciplinary. The objective of the method is not to allow the existence within a product of anything that is not strictly necessary, with the aim of allowing the product to respond by means of its functions to the level of necessity desired by the user [2].

The quality characteristics of the products are determined by designers in the conception or re-conception stage by means of:

- The establishing of product configuration;
- The selection of materials and processing methods;

- The establishing of processing precision and technological regime;
- The establishing of the packaging way required by the customer-beneficiary.

The application of the value analysis method implies the establishing of the minimal or maximal level of the quality characteristics for the new products or for those that must be improved by means of re-designing. In this way the level of product usage is established. The method of value analysis aims, by its specific way [2, 6], at obtaining of the established level of quality characteristics, with costs as low as possible, in order to assure the competitive products.

The method of value analysis promotes the principle of functionality, implying the approach of any product which has a precise destination by studying its functions. The product, by means of its physical component parts is considered the material carrier of the functions it fulfils.

The identified quality characteristics of products are materialized by means of material carriers which accomplish one or more functions within the product.

The Value Analysis studies are conducted in order to determine which ones of the product's functions are useless (meaning that they are not required by the purchasers) and which functions do not add value to the product.

The functions of the product correlate the constructive-technological solutions with the social requirements that generated its creation. This correlation reflects, on the one hand, the quality of its conception and on the other hand it creates the premises of accomplishing manufacturing quality (see Fig 1).

In our opinion within the value analysis studies for new or already existing products there can be used results obtained as a consequence of the applying of the QFD method as far as the selected quality characteristics are concerned and which will materialise into useful functions for the final purchaser.

#### 4. CONCLUSIONS

The QFD method determines the input for accomplishing product design quality turning customer requests into preliminary characteristics for the designing of the product.

The Value Analysis method starts from the characteristics in the design documentation established for the product and turns them by means of its specific approach into characteristics of manufactured product, by means of defining and materialising those functions which are useful and necessary to the purchaser.

Due to the fact that customer requests are quantified and turned into quality characteristics, quantified too, QFD comes to complete the Value Analysis method through orienting and improving product design or redesign activities. In this way, the product will be designed or improved only in those component parts able to fulfil the specified requirements.

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