

Quality Function Deployment (QFD) and Marketing: Towards Customer Satisfaction

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Abstract

The following paper illustrates how Quality Function Deployment (QFD) could be used to operationalize the marketing concept. The relationship between marketing and satisfaction of the customer's needs with the Quality Function Deployment criteria is examined. The QFD as management approach is described, giving special emphasis to the Voice of Consumer's (VOC) phase. The style of communication that results from the application of QFD is discussed. The advantages and limitations of the application of QFD are highlighted. Lastly, some conclusions are stated.

Key words: Quality function deployment (QFD), marketing, voice of consumer's (VOC), satisfaction of needs.

Despliegue de la función de calidad (QFD) y mercadeo: hacia la satisfacción del cliente

Resumen

El siguiente artículo muestra cómo el Despliegue de la Función de Calidad (denominado en inglés "QFD", siglas de "Quality Function Deployment") puede ser utilizado para operacionalizar el concepto de mercadeo. Se examina la relación existente entre el mercadeo y la satisfacción de necesidades del consumidor, tomando como criterio el despliegue de la función de calidad. Se describe el despliegue de la función de calidad como proceso gerencial, prestando especial atención al enfoque de la voz del consumidor. Se considera el estilo de comunicación que surge de la aplicación de QFD. Se remarcan las ventajas y limitaciones del despliegue de la función de calidad. Por último, se formulan conclusiones sobre el enfoque de QFD.

Palabras clave: Despliegue de la función de calidad (QFD), mercadeo, voz del consumidor (VOC), satisfacción de necesidades.

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Introduction

In the sixties, Keith defined the marketing process as the human activity directed at satisfying needs and wants through an exchange process. Today, in the managerial scientific community this concept has been enhanced by Kotler (1991), who states that the marketing concept, which holds the key to achieving organizational goals, consists of determining the needs and wants (1) of target markets and delivering the desired satisfactions more effectively and efficiently than competitors do. As it can be deduced from Kotler's definition, the satisfaction of the consumers' needs is essential to the core of the marketing concept. In this sense, marketing is a long-term multifactor plan, in contrast to the sales concept that is short and focused only on the sales objective factor.

For any business firm or company, identifying and satisfying the customers' needs must be the main direction of management, therefore the idea of customer satisfaction is to be present not only in the marketing subsystem but also in all the organizational units. It has been said that if the marketed product cannot satisfy the needs of customers, the marketing and the business objective of the company cannot be fulfilled (Kotler, 1991). For this reason, many business managers are aware of the marketing concept and its relationship to sales and profitability.

Often, the difficulty in achieving marketing objectives lies in the complicated process of operationalizing marketing goals. It could happen that the marketers have a good understanding of what marketing means, but they do not know how to implement this concept in practical situations nor do they visualize how to operationalize the customers' needs. Furthermore, other reasons explain

failures from a marketing framework. One reason can be attributed to the tendency to disregard the customer's voice and magnify the voices of engineering or top executives another reason is the loss of customer needs information as the product moves through the product development cycle; lastly, the different interpretations of specifications by the departments involved influence the loss of information on what the customer needs.

On the other hand, the quality dimension has appeared as one of the solutions for fulfilling the objectives of the marketing process. Many firms have proved that the quality function in the business field is an important dimension that managers should consider as a way to operationalize the marketing concept. The achievement of the marketing concept is gained through the total quality concept and quality must be reflected in both, customer satisfaction and profitability. Nevertheless, in recent years, the quality concept has been developed with such speed that the marketing process has not been able to incorporate the innovations to the same extent as the quality process has been able to do it, with the implication that the marketing process, in some cases cannot use the enormous amount of information that the quality dimension generates.

In this sense, *marketing* and *quality* concepts share common aspects targeted at satisfying the customers' needs. To blend these two concepts, the marketing process and the quality function, a new approach has appeared to improve the knowledge of the customers' needs and to find out how their satisfaction can be fulfilled with a quality criterion in a segmented market. As it will be described throughout this paper, this new methodology called Quality Function Deployment (QFD) is one of its most important components of the total quality management approaches that has

gained a great deal of attention in the last two decades.

1. Marketing and satisfaction of the customer utilizing QFD

The concept of customers' satisfaction has been receiving increasing attention in the literature during the last three decades. The marketing mission is the identification of customers' needs, with complete and in-depth understanding of what customers are requesting in some specific unit of time.

In the opinion of O'Neal and LaFief (1992), the understanding of customers goes further than the *written* specifications of any given need; the marketer requires to identify as much as possible of those present needs in a segment of a consumer population. Going beyond the stated needs of the customers is the key to what is called Quality Function Deployment (QFD).

The concept of QFD was introduced in Japan by Yoji Akao around the sixties. By 1972, the power of the approach was demonstrated by using it at Mitsubishi's Kobe shipyard in Japan. In 1978, the first book on the subject was published in Japanese. Other Japanese firms have used this approach with important accomplishments. Quality Function Deployment was brought to the United States of America by the Ford and Xerox firms in 1986. By 1989, twenty-four U.S. companies used this methodology and in the 1990's, more than one hundred firms have been reported to have utilized it (O'Neal and LaFief, 1992:137).

Quality Function Deployment uses the analogy of houses to illustrate the functioning of the process and the integration of the information into action plans. The model resembles a guest as the customer who is "invited"

to visit some house, which is the firm and the development of the product. The team assumes the host role and the different parts of the house are the different units in the firm. The customer is "taken for a walk" through the different parts of this house. In each part the guest gives his opinion of what he wants. This methodology utilizes third dimension techniques that are presented as "virtual realities" to the customers. These "virtual realities" are deployed through the process of creation and development of a product to determine the quality that consumers are requiring.

Quality Function Deployment is based on an organizational approach that focuses on the lens model proposed by Brunswik (Griffin and Hauser, 1992). It uses verbalized perceptions of customers as a model or "lens" to see what the customers want, what their preferences are and how competition and sales could be affected by such perceptions. The customer is the main aspect in the chain of creating the product or service. It is important to emphasize that this approach is a rational based method, in which the need and satisfaction of the customer are assessed by *objective* means.

One important condition of QFD is that a team makes the work. Quality Function Deployment focuses on the design, manufacturing and marketing of the product, always with the information provided by customers. The purpose of QFD is to deploy the necessary quality to satisfy the customer. Thus, obtaining the voice of the customer is the focal point of the QFD process. If an inaccurate representation of customer desires is obtained, the QFD process will fine tune the system to bring forth the wrong product.

Quality Function Deployment has risen in contrast to the traditional sales buying concept. In the traditional approach such as

sales, marketing is understood as one of the departments of the whole firm. By contrast, in the QFD concept, the marketing unit interacts with other components of the company as well as with customers. Consequently, when QFD is applied, different departments of the firm have a team spirit, removing departmental barriers and accomplishing cooperative work.

Andrade and Campo-Redondo (1998) stress another important feature regarding QFD, which is the quality dimension. Quality Function Deployment emphasizes quality in all of its scope. Quality Function Deployment considers that each phase of the marketing process must be focused with the quality criterion.

Many companies are using QFD to create and improve their products. To mention some examples, Motorola has achieved important awards as a firm using the approach of focusing on what their customers want (O'Neal and LaFief, 1992:136).

In addition, Toyota has used the Quality Function Deployment approach since 1977, following four years of training and preparation. Results have been impressive. Between January 1977 and April 1984, Toyota Autobody introduced four new van-type vehicles. Using 1977 as a base, Toyota reported a 20% reduction in start-up costs on the launch of the new van in October 1979; a 38% reduction in November 1982; and a cumulative 61% reduction at April 1984. During this period, the product development cycle (time to market) was reduced by one third with a correspond improvement in quality because of a reduction in the number of engineering changes (Bagozzi, 1995).

Gillette is other company that spends every year more than one million dollars for shaving-testing programs utilizing a QFD approach. They have interviewed people to find different needs that these customers are pre-

senting with the shaving routine. The Atra model (a type of razor with a swivel-head) was introduced in the market after researching some characteristics of the Trac II razor (another type of razor). The Trac II model was not fulfilling what the customers were requesting, so the Atra model was introduced to accomplish the needs of the customers that the Trac II could not (Bagozzi, 1995).

Another important firm that has gained much attention for its profitability is Puritan-Bennett. This company utilized the QFD methodology to design a spirometry, a device used in measuring the total volume of air in the lungs as well the amount of exhaled air (Hauser, 1993). Improving of this medical diagnostic tool led the organization to make important advances in marketing and profitability in comparison with its competitor -Welch Allyn.

In Venezuela, the marketing concept has been utilized sparsely. It appeared very incipiently in the fifties when the Venezuelan society moved from a rural based economy to an industrialized one (Vanmarcke, 1988). However, the big companies above described functioning in Venezuela usually develop the quality standards of their products in segmented markets based in the countries in which such companies have their head quarters. On the other hand, managers in Venezuela tend to develop the marketing concept based on the sales approach rather than on the deployment of products to improve quality. Even though the quality concept has been introduced in some business in Venezuela, such as the most important company owned by the state, *Petróleos de Venezuela (Pdvs)*, the approach that still prevails to operationalize the marketing concept is that of the sales oriented.

2. Description of quality function deployment

Quality Function Deployment utilizes a systemic model -included the visualization to expose to people how the product or service works- represented by "houses" in which each "part of the house" is understood within the marketing, engineering, R&D, manufacturing and management framework. The model functions as a matrix, in which a translation of customers' needs is converted into marketing languages, engineering and other components of the firm.

Griffin and Hauser (1992) and Hauser (1993) have made a good explanation of the functioning of these houses and their expositions are summarized as follows:

a) The "house" of the Voice of the Consumer (VOC). Also known as the house of quality. This house consists of the description in the customer's own words of the benefits they would like from a product or service.

A customer need is a description of the benefits to be fulfilled by the product or service. Other important investigation in this stage is the comparison of the customer perceptions of competitive products. Generally speaking, the one-on-one interview or group approach (6 to 8 customers) is used to interview a group of customers and discuss with them their needs regarding a new product or service or improving an existing one. Once the team of the firm has obtained a large number of customers needs (around 200 to 400) these needs are classified hierarchically and divided into three types of needs.

The primary needs are the strategies or basic needs, and of course, they are the most important for customers. These needs respond to the question of what they will assume the

product will do. The secondary needs are the articulated needs and they are classified considering the design of the product and the marketing possibilities and strategies; also, this set of needs answers the question of what the customers say they want the product to do. The tertiary needs are based on the provision of specific direction for the engineers; also they contain the excitement or surprise characteristics of the product, meaning, how clients will be surprised if they find a specific characteristic in the product. The voice of the customer involves the identification, structure, priority and comparison of customers' needs. In the marketing approach, the voice of the customer stage is the phase that marketing pays more attention due to the relationship between customers' needs and design attributes.

b) The "house" of the Voice of the Engineering. In this step, the needs of the customer are translated into engineering concepts. Items such as "time to perform the task" or "initial setup time" are analyzed. Also, the physical characteristics of the product of the company are analyzed. Once engineering has an idea of the product, a matrix is generated, giving special attention to the developing of different relationships of the physical features of the idea. The "roof" of the house is built in this stage, with the quantification of the physical characteristics and relationships among the design attributes of the product. Moreover, in shaping of product, the team needs to estimate costs, feasibility and technical difficulties for changes in each of the design attributes. This phase links the design attributes to actions the firm can take.

c) The "house" of Manufacturing Process. In this stage, actions are linked to implementation decisions and manufacturing process operations.

d) The “house” of Production Planning. This phase links the implementation of manufacturing process operations to plans for production. .

Griffin and Hauser (1992) consider that the best known of these houses is the house of quality. In the implementation of the QFD approach, the VOC is one of the most important components. The VOC sets forth a hierarchical set of customer needs where each need or set of needs is assigned a priority that indicates its importance to the customer. In this step of the process, the team working on the development of the new idea focuses attention on the voice of the customer. A group of customers is asked in detail about their needs related to a new product or to improve one. For instance, in the design of a new light system in a car, headlights can result in the need for “lights up the road with a fully loaded trunk.”

Quality Function Deployment can be conceptualized as a matrix, in which different components are added, until completion of the product, this means the satisfaction of the customer. O’Neal and LaFief (1992:141) have described this matrix in nine steps that are summarized as follows:

- **Step 1: Determination of the customers’ needs:** This step answers the question of what customers want in the product or service.
- **Step 2: Identify product control characteristics:** This step translates customer requirements into technical specifications. It answers the question of how customers’ requirements can be delivered.
- **Step 3: Developing of the matrix relationship:** This describes the degree to which each technical characteristic influences the customer desired requirements; the customer weight in the relationship.

- **Step 4: Developing the matrix related to the changes:** A matrix that shows how a change in one product control affects another characteristic is developed.
- **Step 5: Market evaluation:** A new addition to the market evaluation is made. This step covers customer expressed importance ratings for the listed requirements and competitive evaluation data for existing products.
- **Step 6: Competitive evaluation:** A control of the company’s product or service is generated.
- **Step 7: Key selling:** A strategic approach is generated to sell the product.
- **Step 8: Target values:** Target values are developed for each of the product control characteristics. These characteristics are based on the agreed selling point, the customer importance rating and the current product’s strengths and weaknesses.
- **Step 9: Further deployment:** The aspects of quality control of the product are selected, based on the comments of the customer satisfaction point of view

The process of identifying customer needs is a qualitative task. Around 10 to 30 customers of a segmented market are interviewed by 4 to 6 experts. The interview could be one to one, or it could be a focus group composed of 6 to 15 customers. The experts ask the customers to make a complete and creative description of what they consider could be their needs; in addition, the interviewers request the customers to figure out hypothetical experiences with the product that has been worked on. For instance, working with the idea of improving a new personal computer, the customer can be asked to picture himself viewing work on a computer. A precise description of his difficulties can be

requested. Then a portrait of his experience is reported. The interviewer maintains an empathetic problem-solving attitude and could ask for complete descriptions of the need worked on. The interview ends when the team feels there are no new ideas that can be generated.

Griffin and Hauser (1993) have developed a statistical technique to determine the number of ideal customers that need to be interviewed. They concluded that with 20 to 30 customers it is possible to identify 90 percent of the cluster needs in a relatively homogeneous customer segment. With respect to the number of persons in the team, the ideal number is around 4 to 6. These authors have also found that there are no significant differences between the one on one interview and the focus groups. They recommend the focus group over the personal interview due to the costs of the personal interview.

3. Quality function deployment and communication among the units of the organization

There is important evidence in the literature about the positive relationship between different communication units of an organization and the development of a new product (Griffin and Hauser, 1992). In this sense, QFD is considered as one representative of the quality concepts in communication and cooperation among different teams in a company. An advantage of utilizing QFD relies on the fact that this approach has proven to encourage communication and cooperation among the different units by requiring input from marketing, that is the consumers voice, engineering, and agreement on interrelationships. One of the functions of the team applying QFD is understanding and accepting the inputs generated by the customers through

communication specific plans. Therefore, the underlying factor in QFD is the interfunctional intercommunication among the different units involved in the process of creating or improving a product or service.

When QFD is used, all the teams of the organization participate in the creation of the new product; therefore, all teams accept the inputs from different units. In this sense, research has shown that QFD enhances communication among functional groups, such as marketing, engineering, and manufacturing (Griffin and Hauser, 1992: 360).

In this tenor, Griffin and Hauser, (1992) conducted a study in which the patterns of communication were analyzed. These authors contrasted the patterns of communication that resulted from the application of two different quality control managerial approaches, Quality Function Deployment and Phase-Review Development. Two different units to improve products in a car-platform firm applied these techniques. The traditional phase team (phase-review) worked in sequential steps before commercializing the product. The QFD team worked systemically as they performed the task of improving the product. The two different teams worked on improving the product, so that each one had its functions and each one was responsible for completing each phase. The top management reviewed each phase before the process went on to the next phase. In the firm studied, both teams reported to the same manager, both had similar functions, and both worked on the same project. The only difference between the teams was the managerial approach that each team used in the development of the product.

The findings suggested that the team using the QFD model had less communication (in social terms) but displayed more efficient patterns of interaction than the team us-

ing phase-review. The communications of the QFD team were more horizontal, with better functions than the style of communication showed by the other team. The authors concluded that the team using a QFD approach tended to present more overall communication, more communication within functions, and more communication among functions. The team utilizing QFD talked together directly to one another rather than through the top of management (Griffin and Hauser, 1992).

The advantages of the QFD model lie not only in the satisfaction of the client but also in the enhancement of the communication within the organization. In this sense, QFD could be considered indirectly as an organizational development (OD) approach, because integration among the personnel involved within the firm is obtained. In addition, when QFD is used, because of the cohesiveness that it is generated in the teams, all the units involved are empowered, and by doing that, one can infer that much of the personal needs of the members are fulfilled (Andrade and Campo-Redondo, 1998).

4. Advantages of quality function deployment

Through this paper we have described the characteristics of QFD as a methodology that focuses on the satisfaction of needs across all aspects in the deployment and development of products or services. In this sense, we want to stress the many outstanding features that Quality Function Deployment has:

- **Quality Function Deployment is a methodology that operationalizes the marketing concept with a quality dimension.** Moreover, it is a scientific approach that has its

steps specifically defined. The validity of what the marketer desires to measure (the customers' needs) is assured. QFD is an outstanding methodology that enhances face validity, that is, the representation of the developed product in terms of what the customers are requesting.

- QFD is a structured process, a visual language, and a set of interlinked engineering and management charts. It establishes customer value using the voice of the customer and transforms that value to design, production, and manufacturing process characteristics. The result is a systematic engineering process, which prioritizes and links the product development processes, so that it assures product quality as defined by the customer or user.
- Quality Function Deployment brings together a team of people from many parts of the organization. Teams often consist of people from sales, marketing, research and development, manufacturing, purchasing, as well as from suppliers. This team works together to understand the customer's needs and wants, and generates and sets priorities for how the company will satisfy those needs.
- Quality Function Deployment enhances communication patterns and provokes more horizontal styles of communications. This means that the teams of different units have direct communication with each other. If it's utilized appropriately, QFD can be considered as an organizational development approach, due to the cohesion that this approach generates on the team.
- Quality Function Deployment has reduced design time by 40 percent and design cost by 60 percent while maintaining and enhancing product design quality and

customer satisfaction (Griffin and Hauser, 1993:2). Furthermore, with the utilization of QFD, the firm doesn't need to spend money in redesigning or reworking a product, since the satisfaction of the client is measured in each stage of the development of the product.

- Quality Function Deployment provides a detailed comprehensive concept of customers' needs and how their ideas are represented in the product features as their voices are considered. This has the implication that the loyalty of clients can be assured, since they are going to receive what they need.

5. Limitations of quality function deployment

Even though QFD has displayed many advantages in the managerial field, managers need to be aware of its disadvantages. In this tenor, we want to emphasize some of the limitations that managers could confront when applying this methodology.

- **Quality Function Deployment is a methodology that stresses the rational, objective and conscious needs of customers.** It is based on the assumption that customers know what they need. This situation is very important for specific devices, such as parts of cars and computers that have a rational use. However, it will be interesting to research what will happen with some products that are not designed to satisfy rational needs.
- Quality Function Deployment was inspired as an approach for planning, based on customers' needs. To apply QFD it is mandatory that the different units of the firm have the disposition to work as an in-

tegrated, systemic team. This means that it is necessary that the people involved in the project of the development of a new idea should reach a level of engagement as members of this company. The different "houses" (departments) of the firm need to be very interconnected and they must have in mind that the objective of their work will be the satisfaction of the client. To fulfill this climate, the company needs to be aware of the quality concept as the tool for succeeding. This has the implication that other departments need to be involved such as Personnel, Organizational Development and others related to the firm human resources.

- Quality Function Deployment requires a great deal of patience, time, discipline and human effort to understand the needs of the clients; more information from the customers is required in comparison to the demand of information in the traditional marketing approach, therefore managerial personnel of the company must understand this. If top management doesn't understand these aspects of QFD, a big amount of money can be wasted and a high level of frustration could appear among the persons involved in the project.
- Quality Function Deployment was first developed in Japan in response to a demand for improving the quality concept. This country has a tradition of quality managerial style in its industries. Even though there is a significant number of firms that have reported the benefit of this approach, one might think that it is important to understand the firm culture and the country culture where is going to be applied the QFD.

Conclusions

This paper represents a theoretical revision of the QFD concept in the context of marketing process. Quality Function Deployment provides the business field with a complete quality theory and practical steps to integrate the core of marketing the customers' needs into the development or improvement of a product. With QFD and its considerations about the voice of the customer the language of the customer can be translated into technical language more precisely than the traditional marketing approach does. The marketer can have a deep and broad understanding of the needs of the customer, guaranteeing the validity of the product from marketing perspective.

As an overall concept, QFD provides a mean to translating customer requirements into the appropriate technical requirements for each stage of product development and production (i.e., marketing strategies, planning, product design and engineering, prototype evaluation, production process development, production, sales). In QFD, all operations are driven by the 'voice of the customer'; QFD therefore represents a change from manufacturing-process quality control to product-development quality control.

One of the most outstanding features of QFD lies in the fact that it is a visual approach that involves the systemic integration of different units of the firm. No longer will the development of a product fall only on the marketing department. Even though the traditional marketing approach considers the understanding of the needs of the customers, QFD has integrated the satisfaction of the needs with the criterion of quality, in the entire phase of creating and generating a prod-

uct. Since units are integrated around customer needs and customers' satisfaction with the quality of the product, QFD assures that the objectives of the firm will remain within the customers' needs satisfaction and profitability and not in a commodity producing process, as sometimes occurs.

Quality Function Deployment generates an environment in which communications among different units involved in the development of a product are enhanced in a horizontal dimension. This style represents major autonomy and power in the process of making decisions by each of the members. Indirectly, QFD might be considered as an organizational developmental approach, since the approach encourages teams to become more cohesive, more integrated, more cooperative, more self-sufficient and more communicative, generating less dependency from management.

As Andrade and Campo have written elsewhere (1998), Quality Function Deployment needs more research in fields different from those in which it has been applied. Products that serve to satisfy unconscious needs in customers may require a modification of the QFD approach. Perhaps the assistance of other disciplines, such as psychology can help in the development of new approaches than can be used in the concept of QFD

Even though in Venezuela is almost inexistent the concept of QFD, we hope that venezuelan managers develop an awareness on the importance of elaborating the marketing concept with the quality criterion. We believe that the methodology of QFD could bring more quality to operationalize the deployment of products based on the voice of the customers.

Notes

1. Kotler (1991) makes a differentiation between needs and wants, but in the bibliography reviewed no significant distinction between these concepts was found. Even though there is a conceptual difference between needs and wants that the authors of this paper is a conceptual difference between needs and wants that the authors of this paper acknowledge, these two concepts will be treated as exchangeable words.

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