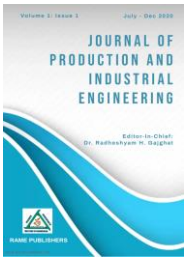

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Customer Oriented Quality and Quality Function Deployment: A Review

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Abstract: **In this research customer-oriented quality technique has been reviewed. It provides an outlook of quality function deployment and its probable scope for development has been provided. This will provide best opportunity for future work. As compared to other quality techniques QFD serves the best technique where quality is measured by the production engineers with priority to the customer's need. In this research paper, the basic guidelines are given for effective implementation of QFD i.e., kind of questions that has been asked to the customers, the prioritization of customer requirement and transformation of those requirements into technical terminology for manufacturing of product.**

Index terms: Quality improvement, QFD, VOC.

I. INTRODUCTION

In order to manufacture a good quality item, customer's need or demand has been clearly defined. From the production design engineer's point of view sometimes customer requirement could seem to be hazy [9], indefinite, incomplete specification of the product. Whatever customer expect from a product is expressed in terms of 'What'. But this 'what' is not sufficient for the designer to understand the feature of the product because customer expresses only what he wants or needs, but how his 'what' is converted into final product is lookout of the designer because customer need is ambiguous and layman language. To convert his 'what' into technical terminology is quality personnel duty [12].

QFD is a tool which act as a linkage between customer's 'what' and design engineer's 'how'. QFD is a technique to fulfill the gap between customer's needs and technical specification [2].

The basic motto of QFD is to incorporate the customer's voice to manufacture good quality products by proper designing of product according to customer requirement [1]. If any firm successful to satisfy their customer with their product and become a popular brand then their other new products need less effort of marketing. Firm has to maintain the quality of products and ready for some modifications as per future demands [14].

A. Quality function deployment

It is the process to manage the quality as per customer needs. In this quality control process customer requirement play most crucial role [13]. Proper steps are taken by the organization to know their customers and their demands and customize their product accordingly.

Existing method of product development process optimization:

1. Time oriented optimization technique
2. Quality oriented optimization technique:
   a) Design quality control
   b) Manufacturing quality control

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c) Whole process quality control
   - Quality function deployment
   - Total quality management [13].

Till now most of the researchers paid attention to mostly design quality, manufacturing quality but since the customer needs are equally important because end product is used by customer. Therefore, whole process quality control is equally important, in which QFD is important tool.

Voice of customer → Defining the product → Designing of product → Process development → Implementing the process

Figure 1: Steps involved in quality function deployment process

Customer focus can be defined as the concern of a manufacturer to satisfy their customer needs and what their customer expects from the product. A booming industry worked on a policy to put the customer in important place in every decision made (Philips Quality, 1995).

In quality management it is essential to maintain a good relationship with the customer by knowing their needs and taking feedback to fulfill their requirements [11]. To reduce or eliminate problems related to quality of final product the organization has to involve customers in every stages of production especially in designing and product development phase [16].

Whenever discussing production line, it is suggested that customer plays a most crucial role and every product manufactured in production line are basically aimed to the customer requirements [17].

Company takes information related to customer's complaints seriously because that information helps to improve the quality of product or service provided to the customers by company. Since the complaints related to quality are different from any other problems therefore, it requires different department acting on it. On the basis of customers complaints, it is mandatory to identify the most critical and important complaints which demands through knowledge to identify cause of those problems and find the suitable solution [18].

All over the world global warming and pollution level will rapidly increase due to which it's necessary to design the product eco-friendly in nature. For this the conventional method of QFD design are failed. Therefore, fuzzy QFD will introduce which is nothing but combination of QFD and fuzzy logic. Many case studies prove that this combination worked very well. This fuzzy QFD mainly utilizes in supply chain management [9].

To satisfy the customer, QFD is a tool in which customer needs are translated into technical requirement [2].

House of quality is soul of QFD, which is nothing but matrix which provides direction for designing and development. A product according to customer need as well as prioritize the technical specifications to satisfy the need of customer [6].

There are many advantages of QFD for any firm like low lead time, early identification of problem and redesign easily with few modifications with full customer satisfaction [19].

For prioritizing the given requirement by customer, a program has been established which is known as analytic hierarchy process (AHP) [20].

Most of the American citizen or production philosopher think that QFD and house of quality is similar but house of quality is a element of QFD [21].

A survey has to be conduct to know how much customers are satisfied with the product. This survey helps to solve the customer's complaints. Through this identify the reason that why the product is lacking in market and try to correct it by applying suitable mathematical algorithm. Quantitative analysis of customer satisfaction is done by using these algorithms [5].

Any firm has to understand the requirement of the customer or what customer wants from the product in present and in future as well. Company has to satisfy those requirement or expectation of customers for that design of the product and service accordingly [8].

In any firm, factors that affecting the proper implementations of QFD are [4]:

- New product manufacturing
- Money invested
- Firm size
- Management support to innovation
- Team spirit and dedication of people to provide quality product every single time.
- Adaptation of new methods and techniques for quality improvement.

QFD is a process of manufacturing or service engineering, which transform the thought or idea of the customers mind into appropriate technical words required to manufacture a product. It acts as a glue to improve quality. QFD plays a crucial character (like marketing and sales ideas, product design and development of prototype, quality testing and control etc.) of product development. QFD operations are fully oriented towards requirements of customers. Quesada (1997) provide various examples of how TQM tools are used to find the customer needs and design a process for prioritize those needs [7].

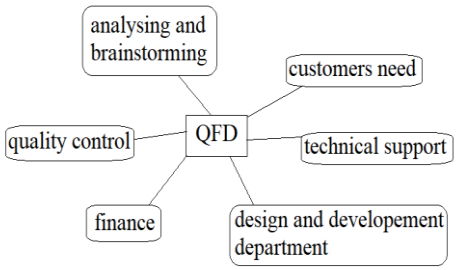

Figure 2: Basic elements needed for proper implementing QFD.

QFD was impressively used by Toyota motors and gives tremendous results between 1977 and 1984. They introduced new vehicles in the market which reduced 20% startup cost in 1979, 38% in 1982 and 61% in 1984. Not only they reduced startup cost but also quality was improved whereas the cycle of product development was reduced one third. All this was happened due to effective implementation of QFD [1].

Two important elements of QFD theory are factor analysis and dynamic analysis. If firm approaches non-conventional QFD, customer requirements are reduced in a structured manner by using factor analysis whereas comparison between past analysis and relationship with the reduced one is called dynamic analysis [15]. Both elements are very useful to know the actual need of customer so that unnecessary information is thrown out of house of quality matrix. This will simplify the planning of material selection, processing methods and development stages of manufacturing.

Working procedure of QFD can be illustrated through the car manufacturing firm:

- At first to know the requirement of customers from a car, a questionnaire form has to be developed. In this form following questions should be asked -

1. What kind of car you are looking for?
2. Which brand's car you used before?
3. Usage of car?
4. Is it for your personal use or for commercial use?
5. How many members are there in your family?
6. Are you satisfied from your previous car's features and services?
7. Please rate the following factors which affect your decision for purchasing a car-

TABLE 1

FACTORS FOR RATING

S. No.	Factors	Rating of importance				
		1	2	3	4	5
1.	Seating Capacity					
2.	Safety features					
3.	Comfort level					
4.	Ease of maintenance					
5.	Aesthetic features					
6.	Engine power					
7.	Purchasing cost					
8.	Average or mileage of the car					
9.	Availability of spare parts					
10.	Insurance policy					
11.	Car's brand					
12.	Resale value					

1- Less required, 5- highly required.

8. If you have any suggestions, what else are you looking for?

Please let us know.

- After survey of plenty of people and taking an average result, it is easy to pick important requirements of customers on which the firm has to work on.
- After this step, company's supervisors and technical experts define this customer requirement into technical terminology like; motor RPM, engine HP, suspension system, break horse power, kerb weight, seatbelt and airbags installation, fuel tank capacity, speed limit, production cost etc.
- After getting customer's requirement and technical specifications, data house of quality has to be built. In this, a relationship matrix table between VOC and technical specifications has to be drawn [3]. Also, a correlation matrix between various technical specifications is drawn which creates the roof of house of quality.
- After establishing relationship between all the data, relative weightage has been calculated and this helps to plan the manufacturing strategy of any product.
- QFD helps in various planning's and execution of these plans in production and services. i.e.;
  1. Financial planning
  2. Product design and development planning
  3. Maintenance and insurance planning
  4. Sales and marketing strategy planning
  5. Quality control and improvement planning [10].

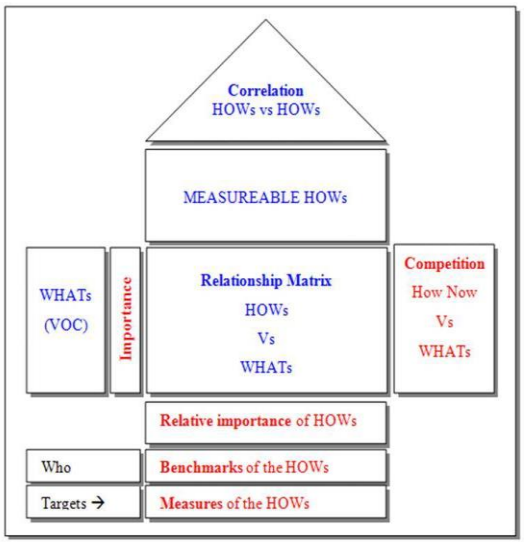

Figure 3: Basic Structure of House of Quality

III. Conclusions

Now-a-days market worldwide is dynamic in nature. Therefore, to focus on public need is main concern of any firm to avoid declining of product and maintain good position in local and international market. For this company has to increase interaction with customer and taking their feedback seriously. QFD provide basic guideline to improve the quality of product or services to satisfy the customer as well as make profit out of it.

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