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# VOICE OF CUSTOMER A QUALITY FUNCTION DEPLOYMENT APPROACH; A QUICK REVIEW AND ITS IMPLEMENTATION IN SMALL ORGANIZATION

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## ABSTRACT

Quality Function Deployment is a tool for bringing the voice of the customer into the product development process from conceptual design through to manufacturing. As this is the demand of today's market that companies have to respond according to the demands and needs of the customer and QFD is the best tool to respond according to the customer voice. The paper contains the QFD implementing solutions for the small size industry. As the small size industries do not have enough resources to work on lengthy QFD Houses. So in this paper I introduce some simple and cost effective ways to initiate the QFD process into small industries.

## KEY WORDS

Quality Function Deployment; Customer needs; House of Quality; Marketing strategy; Flexible Manufacturing; Quality Circles

## INTRODUCTION

It is becoming very prerequisite for the firms to design and develop products and services according to the customer's requirements and needs. In recent years, a variety of industries around the world welcome QFD [Prasad B (1998)]. QFD is the well structured technique and tool to produce products and services according to customers needs.

QFD was developed in Japan in 1960s (Krishnan and Ulrich, 2001; Tena and Comai, 2003). As we look back into past we will see that many world leading firms are focusing on the Total Quality Management and its different tools like QFD is one of the major tool of TQM.

The study of the Baldrige Finalists the General Accounting Office (GAO 1991, Strattin 1991) suggests that the firms who practice total quality management in there business processes their market share also increases along with the customer satisfaction, profitability and employee relations.
It will be not wrong to say that the one of the major reason to implement TQM in an organization is to get benefits of its one of the best tool QFD.

For example when Toyota motors adopted QFD in late 1970s the impact was so effective that there was 60% reduction in the design cost and 40% reduction in the design time.

Furthermore QFD is the great tool to establish a good understanding between the marketers and the engineers of the organization as QFD displays the Customer requirement and product design in graphical format which generally named as 'House Of Quality' when the understanding between the marketers and manufactures with in the company improves this evolves a form of a customer input that has become known as "Voice Of Customer" [Abbie Griffin, 1993]

The "Voice of Customer is a hierarchal diagram that represents the customer's needs and each customer's need is placed from top to bottom according to their priority which finally indicates the need importance to the customer. Similarly the key criterion for the Balgrige Award is that "Quality is based on customer (NIST 1991)" (see also Juran 1989).

This paper focuses on the customer input that finally used for new product design and development. One goal of our paper is to bring awareness (about QFD its application, processes and benefits) in such organizations who are still using traditional ways for the production and development or those who want to initiate a QFD processes into there organization. In this paper we focused on the major organizational blocks (Manufacturing, marketing, engineering, and R&D)

## QUALITY FUNCTION DEPLOYMENT: A BRIEF REVIEW

According to the researches in the Management of technology the cooperation and communication among the marketing, manufacturing, engineering and R&D is required which leads to the improved and innovative new product, as the product quality improves, the cost of production reduces this will results in production of more profitable product (Cooper 1983, 1984a, 1984b, Gupta et al 1985).

It is just like the New-Product-Development process in marketing (Pessemier 1986, Shocker and Srinivan 1979), the lens model (Brunswick 1952) and the benefit structure Analysis (Myers 1976). In the same way like these marketing process works, the QFD use perception of the customer needs as a lens with which the product is finally designed, engineered and delivered to the customer. It also tells that how the variations in the product and service characteristics and polices effect the overall customer satisfaction, organization performance and ultimately the sales.

QFD is a customer driven approach to the quality management and product development for achieving the customer satisfaction [X. X. Shen, K. C. Tan and M. Xie]. QFD uses four sets of matrices to establish relationships between company functions and customer needs. The four matrices include product planning, parts deployment, process planning, and production planning [Cristiano JJ, Liker JK, White CC III, (2000)] QFD is based on the inter functional planning and communication between (marketing, manufacturing, engineering and R&D) [Hauser JR, Clausing D (1988)] the basic reason behind this all is to keep customer involve throughout the product design, manufacturing and delivery process and finally the firms get total quality and customer satisfaction that ultimately results in the overall firm's growth.

QFD presents data in a Graphical Format. QFD uses the house of quality which is a matrix that provides a conceptual map for the design process and customer requirement and also establishes the priorities of design requirement to satisfy them [Taeho Park, and Kwang-Jae Kim,1997]

Design attributes are the engineering measures for the product performance. For example a computer customer might state that he/she needs something to which make it "easy to read what I'm working". The first solution for this is to provide the computer customer a monitor with which they can see their work. Now the design attributes for the monitor can be its size, brightness, pixel ratio, etc. the second house of QFD communicate these designs attributes to the actions that the firm can take for example the design attributes of the monitor will be sent to the firms product development team now the team may act to change the number of pixels, the size of monitor or the refresh rate. The third house of quality leads the

actions to implementation phase that includes manufacturing process and the final house of QFD links the implementation to the production planning.

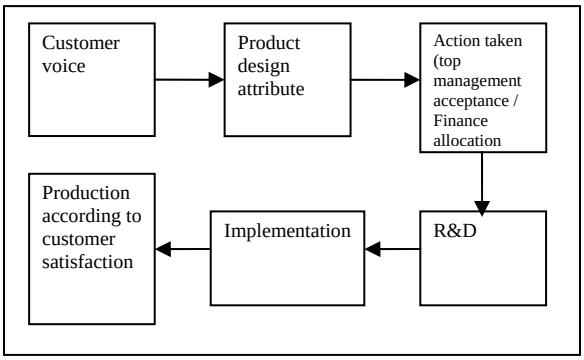



***Fig. 1***

The process given in *figure 1* gives a brief overview that how the QFD implementation results in customer satisfaction

## DYNAMIC HOUSE OF QUALITY

The Dynamic house of quality converts the customer needs and wants into a required product or service through continuous feedback loops [Cindy Adiano, Aleda V. Roth,1994]. The dynamic HOQ sends the updated or current customer satisfaction and requirement data directly to the manufacturing, marketing, engineering, and R&D departments.

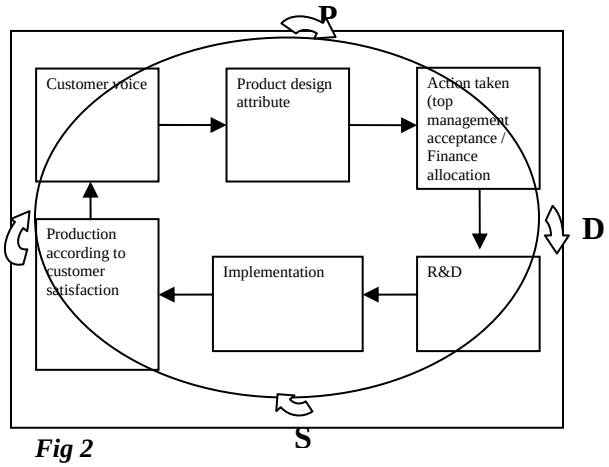



***Fig 2***

*Figure 2* shows the ongoing process through which an organization can continuously get the updated data about customers and organizations then respond to customers accordingly. Management can also apply PDSA cycle [Deming, Quality Control Handbook, 1951], in this process for better results.

U.S. companies just restrict themselves to the first house of QFD that is “Linking the customer requirements to the design attributes” [Cristiano JJ, Liker JK, White CC III, (2000)] as they more believe on the updated customer data sources for example Focus group. So by applying Dynamic HOQ approach U.S. firms now can use the other three houses of QFD as well.

## MARKETING RESEARCH TECHNIQUES AND HOUSE OF QUALITY

Although the traditional HOQ has been successfully used for several decades to analyze the customer requirement and match them with the product design attributes. There are number of successful cases regarding the use of traditional HOQ but still there are some problems in implementation process, and the large number of firms failed in this regard [Temponi C, Yen J, Tiao WA (1999)]. According to the recent QFD publications the major problems in implementing the traditional QFD can be categories as follow: it is complex and very time consuming[Huang GQ, Mak KL (1999)]; the size of matrices is to big[Shen XX, Tan KC, Xie M (2000)]; it becomes difficult to discriminate between diverse and conflicting consumer needs[Akao Y, Mazur G (2003)]; the voice of customer is dynamic in nature and current listening to the voice of customer is not enough[Xie M, Tan KC, Goh TN (2003)]; it is difficult to meet the need of different customers, groups and segments[ReVelle JB, Moran JW, Cox CA (1998)]

The above given problems can be compressed into three major problems
1) The conceptual gap between the customer and designer. 2) The existence of possible customer segments and 3) the need of trade-off among different levels of customers needs" [R. B. Kazemzadeh, Majid Behzadian, Mohamman Aghdasi, Amir Albadvi, 2007]

The reason behind the first problem the conceptual gap between customer and designer is that the customer often convey their needs and wants in a general way like 'most customers says that they want good quality' but actually they want to ask for some value added feature in the existing product. This situation creates the gap and designer can not able to judge what the customer actually wants that ultimately results in the production of such product that is not satisfactory to the customer. The simple solution for this problem is that the organization should do intense market research based upon the following steps 1) identifying your customers. 2) identify the trends of targeted market segment 3)match these trends with your current product design attributes 4) find variance 5) select the manufacturing process 6) do production 7) get customer feedback 8) take corrective actions where needed.

In the above given process of market research the major step that the organization must repeat again and again is the identification of recent or updated trends of targeted customers.

## CUSTOMER SEGMENTATION

Now the solution for the second problem is that the firm should identify its each customer segment [Xie M, Tan KC, Goh TN (2003)] and then design product accordingly. Categorizing customer requirements with precision [Shahin A, Chan JFL 2006] as it is very obvious that each and every market segment has its own set of common needs and priorities. So if the organization put its different market segments one by one into the house of quality and do market research accordingly then the firm can get a very relevant customer need and requirement data about the product design.

Secondly the firm can go for the conjoint analysis that is multivariate technique use specifically to understand how customer develops preferences for the product [Hair JF Jr, Anderson RE, Tatham RL, Black WC (1995)]. With the design point of view conjoint was introduced as one of the market research tool for creating more attractive products in future [Akao Y, Mazur G (2003)]. The conjoint approach is very useful in the identification and understanding of benefit segment [Kamakura WA (1988)].
The organization can also use the Pareto charts or 80-20 rule (Joseph M. Juran). Pareto chart is used to graphically summarize and display the relative importance of the differences between groups of data (Pareto, Vilfredo; Page, Alfred N. (1971). Pareto principal states that, for many events, roughly 80% of the effects come from 20% of the causes.

[(Koch, R. (2004)]. If firm design there products  according to this principal that thay fulfill the top 20% requirements of there customers they can achive the greater customer satisfaction and cost reduction in production processes, as compared to thoes who do not use this technique.

The organizations which are new in QFD can follow above given simple market research tools and PARETO Charts in order to get a complete understanding about their customer needs and can produce products that are according to the customer requirements.

## INTEGRATING MANUFACTURING AND HOQ

Manufacturing is the key part of the product development process. The manufacturing process enables the firms to give the physical shape to the conceptual product design. So the better the manufacturing processes the better the product will be. Manufacturing directly affects the profits of the firm.

Now days firms are using advanced manufacturing technology in order to cut down the cost in different ways for example JIT. Furthermore the logistics data processing also get improves by applying QFD in manufacturing [Ertay T, Ruan D, Kahraman C, 2005]

According to house of quality the firm must produce such a product that the customer want and should keep on getting updated data on customer requirements. This thing definitely requires a continuous change in the manufacturing processes as well. As soon as the customer need changes the manufacturing process also change accordingly.

The firm can cope up with such a dynamic situation by introducing flexible manufacturing technique [Jan Olhager, B. Martin West, 2002.] "this approach creates a framework for modeling the deployment of the need for flexibility from customer's point of view into manufacturing flexibility at various hierarchical levels" [Jan Olhager, B. Martin West, 2002.]

The firm may redesign its manufacturing process that can manufacture new and a wider range of products. When the manufacturing unit becomes flexible it will benefit the firm in different ways: 1) it increases the production capacity 2) the set up time will get reduce. Set up time is the time required for the exchange of die. SMED (single minute exchange of die) is the approach devised by Shigeo and Shingo. 3). As the die exchange time reduces the firm's product development response to new customer needs and wants will increase and customers can get new product on time 4) this approach can also become the competitive advantage of the firm.

## PRODUCT LIFE CYCLE AND QFD

When the firm adopts the QFD approach it directly effects the product life cycle and product/process development cycle [Vivianne Bouchereau, Hefin Rowlands,2000]

Now how QFD effects the product life cycle. It is very clear to us that QFD use the voice of customer; the customer needs and requirements changes continuously and firm have to respond accordingly.

For example the firm introduces a new product in market and customers get satisfied with the product design and features certainly the product will move towards the growth stage. As the growth stage is going to get completed the customer's needs and requirements start changing and customer wants something new with more features. Now at this time if the organizations do not respond to the customer changing needs in a timely manner the product will eventually move to the maturity and then declining stage. So if the firm wants to remain in market it have to design product according to the customer wants.

*Figure 3* shows the PLC Stages before QFD implementation here we can see the gap between the stages is short so product quickly moves towards the decline stage and *figure 4* shows the PLC Stages after QFD implementation, here we can see that the gap between stages increased hence the product can enjoy more time in market. We can take an example of Mobilink Pakistan, they are in market from couple of years and if we do analysis of there products PLC stages, we will see that they are still in growth stage, reason behind this is that they quickly respond to there customers requirements and needs and they keep on adding new

features in there products as per market requirements which helps them to give new life to there existing products.

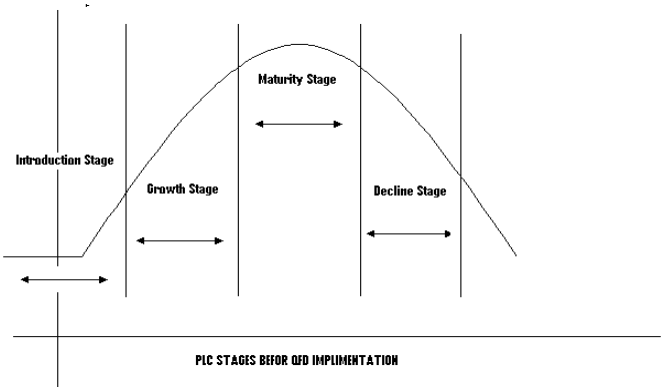
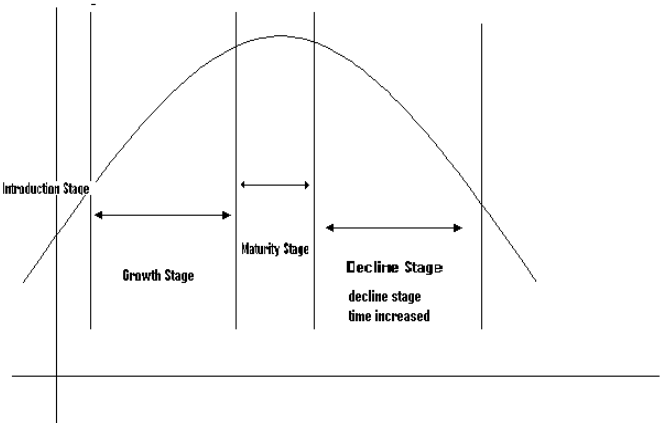



***Fig.* 3**




**PLC Stages After QFD implementation**

***Fig.* 4**

## QFD AND QUALITY CIRCLES

Quality Circle [Hutchins, David C. (September 2008). *Hoshin Kanri*] is a volunteer group composed of workers, usually under the leadership of their supervisor (but they can elect a team leader), who are trained to identify, analyse and solve work-related problems and present their solutions to management in order to improve the performance of the organization, and motivate and enrich the work of employees.

QFD is more a process then a tool for developing product according to customer [C. P. M. Govers, 1999]
QFD requires a team approach, the free communication and information that is available at all levels of the organization. It can be best applying by introducing cross-functional teams in the organizations. These cross-functional teams are consisting of representatives from all the major departments of the organization (engineering, marketing, R&D, Finance) then they communicate with each other freely and share there knowledge about the current customer requirements. If we integrate the QFD with the quality Circles the both approaches work side by side that ultimately results in improved quality packed product that will meets the customer requirements

For example A representative from the marketing department get communicate with the R&D department representative in order to convey the data collected from market researches about customer then the R&D

department work on the data and try to develop such product that meet the needs of the customer finally after designing the product the design will be sent to the manufacturing department where they start production of the product. The *figure 5* given below shows the integration of QFD and Quality Circles.

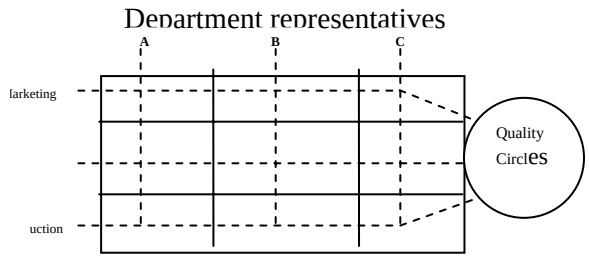



***Fig.* 5**

## PLANNING WITH FINANCIAL CONSIDERATION

QFD can be one of the factors of increasing or decreasing organization's cost. Traditional methods of QFD planning are mainly subjective and most of these methods are technically one sided as they do not consider the design budget, however financial factor is one of the important factor that can not be neglected in QFD planning. Currently the companies in Pakistan they can not able to achieve an optimal point at which they can satisfy there customer and they get satisfied too due to which they have limit customer satisfaction or they have to give up there own interest and definitely most of the companies opt the second option that certainly effects the satisfaction level of customer.

Here a simple model that considers not only the overall customer satisfaction but also the enterprise satisfaction with the cost committed to the product.

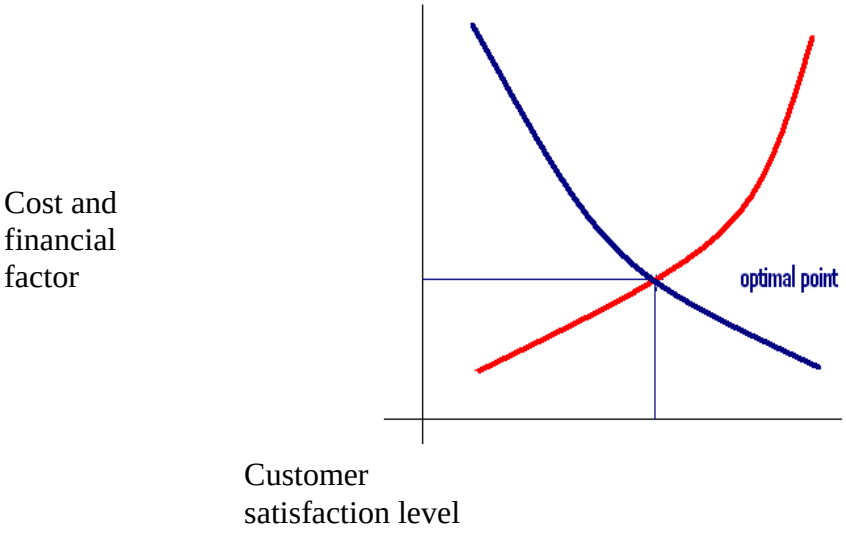



***Fig.* 6**

In *figure 6* the optimal level represents the point where both organization and customer get satisfied. The optimal level can only be achieved by the organization when it can very accurately interpret the customer needs and priorities and then design the product accordingly. The firm can also use the fuzzy formulation and combine it with genetic based interactive approach to QFD planning [. Jan Olhager, B. Martin West,2002.]

## APPLICATION AND BENEFITS

The application of QFD is complex as well as simple. It depends on the firm the way it adopts for QFD implementation.

Currently in Pakistan there is no any specified organization that currently working on the principals of QFD.

In this paper we try to simplify the very complex processes of QFD in order to make it possible for small organizations which are working in Pakistan to implement QFD in there manufacturing, marketing, design and engineering processes. The small firms do not have large budgets to do researches on QFD complex houses but now they can enjoy the benefits of QFD by getting guidance from the simplified procedures and processes discussed in this paper. For example the organization can simply take a start by taking the group interview from there customers about there needs and requirements which they want in product.

## BENEFITS OF QFD

1) customer satisfaction
2) helps in decision making
3) set performance standards
4) Helps to understand customer more closely.
5) Satisfy both the customer and the organization
6) Improves market share
7) Quality achieved
8) Cost reduction.

## RECOMMENDATIONS AND CONCLUSION

We believe the effective implementation of the QFD is the key to success for organization. As the QFD implementation leads to improved customer satisfaction and that satisfaction ultimately leads to the overall organization growth.

The major drawback of industries working in Pakistan is that there management do not try to introduce the new and improved approaches in there processes due to which they lag behind from international market. If they start introducing the simple QFD processes given in this paper they can achieve a remarkable growth rate and that growth becomes permanent.
The traditional approaches to QFD are subjective they do not consider the design budgets and the do not provide updated customer data but now with the dynamic HOQ and optimization of financial factor with respect to both the organization and customer, we can achieve dramatic improvement in organization performance.

Contentious feedback is the back bone of the QFD as feedback gives the voice of customer to the organization. As QFD is the continuous process so the organization must respond to their updated customer requirements in a timely manner.

Implementing QFD in small organizations was difficult due limited resources but now they can use the simplified QFD processes and procedures discussed in the paper in order to introduce QFD in there different processes.

The new and more complex approaches like Fuzzy QFD and TRIZ [Chao-Ton Su, Chin-Sen Lin, 2006] and TQFD approach [N. Kathiravan, S.R. Devadasan, 2008] are available that implements total quality function deployment in the whole organization just like TQM. But there implementation is a big task due to which only fortune companies opt them or do research on them to make them align with there company goals.

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