(Case Study) Application of Quality Function Deployment for the Vendors Selection Process

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Abstract— The manufacturing organizations are facing the pressure of increasing competition due to the varied dynamic demands of the customers. In this competitive scenario, 'voice of customer' gains importance. It needs to be translated into technical language. Quality Function Deployment (QFD) has been used for performing this kind oftranslation. The concept of supply chain is also gaining popularity as manufacturing organizations adopt the conceptof outsourcing as a means to satisfy their varied customers' demands. In supply chain management, vendors selection is a vital issue that has to be done with extreme care. In this context, this paper reports a case study in which QFD technique has been used for vendors selection in an Indian electronics switches manufacturing company. The validationresults indicated the practical feasibility of deploying this approach in industrial scenario.

Key words: Quality Function Deployment, Vendors Selection, Supply Chain Management, Competitive assessment, Implementation study

I. INTRODUCTION

The contemporary manufacturing organizations are facing increasing competition due to the entry of numerous competitors in the global markets. This situation has also been stimulated by varied demands of the customers. The manufacturing era has witnessed numerous paradigms. A shift in manufacturing paradigm has been observed from mass production to mass customized production. The modern customers are gaining importance in this context. The 'voice of the customer' is gaining importance and it need to be translated accurately into technical language (Chan and Wu, 2002). Quality Function Deployment (QFD) is an important technique used for this kind of translation. QFD is aimed at translating consumer's demands into design targets and major quality assurance points to be used throughout the production phase. Researchers haveexclusively worked on QFD and brought various advanced models of QFD. QFD has been widely applied in different sectors. Business process outsourcing is an importantphenomenon as the organizations are not capable ofpossessing all the facilities to satisfy the demands of the customers. This situation has paved the way for the emergence of supply chain concept. Supply chain encompasses all activities associated with the flow and transformation of goods from the raw material stage to the end user as well as the associated information flows. Vendors selection is an important concept of Supply Chain Management. Dependence on the vendors to provide goods and services, which were formerly managed in house, has increased gradually in order to specialize and improve. Within the logistic chain, waste of material can be reduced by developing a long term relationship with the vendors.

For long term buyer vendor's relation, industry should have asmall number of vendors. A firm's growth and competiveness depends on the decision making criteria along with choice of right vendors. As the vendors are very important for SCM (Supply Chain Management) there selection is also important responsibility of the purchasing manager and purchasing department. As purchasing function is gaining more and more importance in SCM the purchasing decisions are becoming vital as these decisions ifgo wrong can impact severely. Due to globalization, vast usage of internet, changing customer taste and trends, the decision-making phase should be as short as possible and more importantly it should be correct. Operations research techniques like problem structuring approaches,mathematical programming and data mining technique s are few methods that may help in vendors selection decisions. Thus the company and vendors relation can be encapsulated in 'house of quality' model of QFD. The vendors selection is a problem that companies face since the beginning of its activity. The choice of vendors/partner is one of the key factors for the operational success of many companies but also a time and resource-consuming complex process. Today, many companies need to constantly strengthen its competitiveness through reliable and efficient supply networks based on vendorss/partners relations in order to increase profit and promote customer value. International competitors, customer requirements, rapid technology changes and short product life cycle influence the competitiveness between supply chains. Companies struggleto counter these forces by minimizing costs, minimizingwaste and focusing on their core competencies. In this context, this research project has been focused on the application of QFD for enabling the process of vendorsselection. The experience of the conduct of this case study will be explained in following sections of this article.

II. LITERATURE REVIEW

In the year 2012 Eshan S. Jaiswal illustrated how quality function deployment was developed for the new products [1].

In the same year Davood Gharakhani done the case study in four star hotels pertaining to the development of quality function deployment model for the improvement of service quality [2].Besterfield, D.H in his book has discussed about the fundamentals of quality function deployments [3]. In the year 2002 Lai-Kow Chan revieved 650 quality function deployment function publications and conducted categorical analysis [4]. In the year 2006 Devadasan, S.R has proposed total quality function deployment technique to pump manufacturing environment to know the its' practicality [5].

Vinodh, S. and Devadasan, S.R have designed an innovative quality function deployment which incorporates an exlusive finantial accounting system also the newly designed concept has been implemented in electronic switchmanufacturing company [6]. The study on "Quality Function Deployment: The Role of Vendorss" was conducted by Ansari A [7].

III. RESEARCH METHODOLOGY

The methodology followed during this research work is shown below. Initially the literature survey is carried out with respect to the QFD techniques. Then a detailed study has been done for selection of organization for implementation. Thereafter the customer requirements and technical descriptors have been selected. Then the house of quality has been developed for vendors's selection, thenfocus was given on prioritization of customers' requirementsand technical descriptions and finally the results arevalidated.

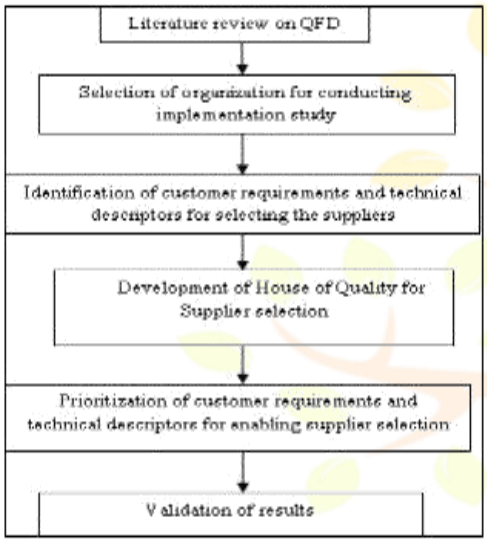

Fig. 1: Research Methodology.

IV. IMPLEMENTATION OF CASE STUDY

In this section, the details about the case company and various steps involved in the construction of HOQ havebeen presented.

A. Identification of Customer Requirements

The case study has been carried out at Company Electronics Limited (hereafter referred to as Company). Company is electronics switches manufacturing company situated at Coimbatore, India. Company was started in the year 1984, with the collaboration of a German company. Company is manufacturing cam operated rotary switches. Other products manufactured by Company include starters and modular switches.

S. No.	Customer requirements
1	Concern on Industry-led Technology
2	Timely delivery of products
3	Preference for high product performance
4	Increasing demand for technical support and after sales service
5	Superiority of product design
6	Reasonable price at highest quality
7	Ability to supply in varieties
8	Availability of skilled manpower
9	Ability to supply as per specification
10	Dedicated capital assets owned by the vendorss

Table 1: The list of customer requirements

QFD starts with a list of objectives. The list has been referred to "What's" the customer expects in the vendors selection process.

B. Identification of Technical Descriptors

The objective of QFD is to modify the system in a way thatit meets the expectation of the customers. After identifying the customer requirements, the QFD team has identified the engineering characteristics or technical descriptorspertaining to the customer requirements. The identified technical descriptors are shown in Table 2.

Serial Number	Technical Descriptors
1	Quality
2	Technological Compatibility
3	Marketing knowledge
4	Degree of fitness
5	Intangible assets
6	Core competencies
7	Responsiveness
8	Discipline
9	Brand Name
10	Expertise
11	Cultural factors
12	Risk factors
13	Value added potential
14	Competitiveness
15	Potential for employment generation

Table 2: List of technical descriptors

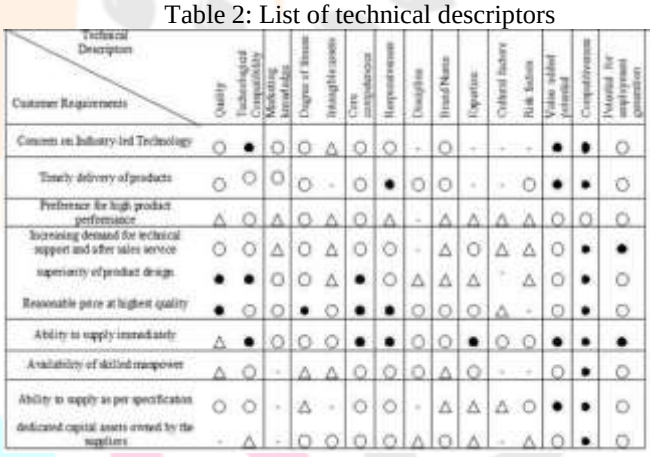

Fig. 2: The relationship matrix

C. Development of Relationship Matrix

The next step in building HOQ is to develop the relationship between customer requirements and technical descriptors as well as their respective relationships. The relationship matrix represents the degree of influence between each technical descriptor and customer requirement. The symbolsused to represent the degree of relationship between the customer requirements and technical descriptors are as follows.

– A solid circle (●) represents a strong relationship with rating 9.

– A single circle (○)represents a medium relationship with rating 3.

– A triangle ( ) represents a weak relationship with rating 1.

The box is left blank in no relationship exists.

V. RESULTS AND DISCUSSIONS

Timely delivery of products' gain vital importance in the process of vendors selection Based on the conduct of the case study the customer requirement. Similarly the technical descriptor 'Competitiveness' is the most important engineering characteristic. This result very much coincided with the practical environment prevailing at the company.

After developing a HOQ for the vendors selection process, it has been decided to determine the practical feasibility of this approach. A questionnaire has been designed for this purpose and the response of the executive has been gathered. An excerpt of the prioritized pair ofcustomer requirements and technical descriptors as well as the rating given by the executive is shown in Table 5.1 the results of the case study relationship with the technical descriptors 'discipline', 'Expertise', 'cultural factors' and"Risk Factors'.

A. Prioritization of Technical Descriptors

Prioritization is importance to customer, target value, scale- up-factor, vendor's compliance and absolute weight.

The prioritized customer requirements a block of columns corresponding to each customer requirement in the HOQ on the right side of customer competitive assessment and represented in Figure 3. The various factors considered for target value is an objective measure that defines the values that must be obtained to achieve the technical descriptors. The scale used for assigning target value is 1 to5 (1 indicates worst and 5 indicates best).

B. Absolute Weight

The absolute weight for the jth technical descriptor is given by

$$a_j = \sum R_{ij}\, c_i \qquad (1)$$

Where

As a sample, the calculation of absolute weight ofthe technical descriptor 'quality' is as follows:

$$3\times 7 + 3 \times 9 + 1 \times 10 + 3 \times 8 + 9 \times 6 + 9 \times 7 + 1 \times 8 + 1 \times 9 + 3 \times 6 = 234.$$

C. Relative Weight

The relative weight for jth technical descriptor is given by $b_j = \sum R_{ij}\, d_i \qquad (2)$

Where

B = row vector of relative weights for the technicaldescriptors (j = 1… m)

d_i = column vector of absolute weights for the customer requirements (i = 1,……, n)

As a sample, the relative weight calculation for thetechnical descriptor quality is shown as follows:

$$3 \times 9 + 3 \times 22 + 1 \times 9 + 3 \times 10 + 9 \times 12 + 9 \times 17 + 1 \times 10 + 1 \times 18 + 3 \times 12 = 457.$$

Higher absolute and relative ratings identified areas where engineering efforts need to be concentrated. These weights show the impact of technical characteristics on the customer requirements. As shown, the technical descriptor competitiveness possesses high absolute and relative weights with values 642 and 1125 respectively.

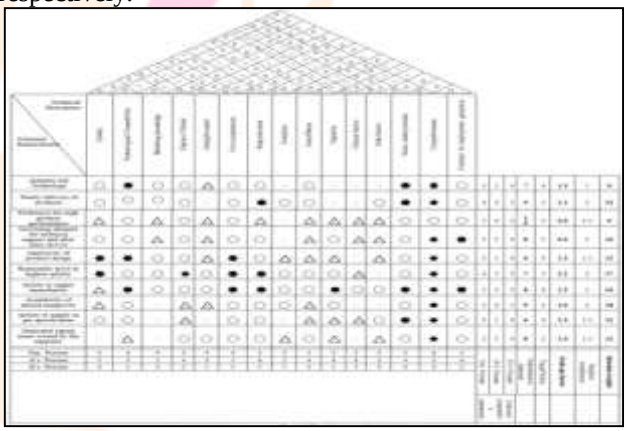

Fig. 3: Prioritization of technical descriptors

a_j = row vector of absolute weights for the technical descriptors (i = 1, , m)
R_{ij} = weights assigned to the relationship matrix
(i = 1… n, j = 1,……, m)
c_i = column vector of importance to customer for the customer requirements (i=1,.., n)
m = number of technical descriptors n = number of customer requirements

S. No.	Prioritized customer requirements – Technical Descriptors	prioritized improvement in Vendors selection process [0 – Not at all, 5– Partially, 10 - Completely]
1	The prioritized technical descriptors for the customer requirement concern on Industry-led technology is Competitiveness	9
2	The prioritized technical descriptors for the customer requirement concern on Timely delivery of products is Competitiveness	8
3	The prioritized technical descriptors for the customer requirement concern on Increasing demand for technical support and after sales service is Competitiveness	9
4	The prioritized technical descriptors for the customer requirement concern on Superiority of product design is Competitiveness	7
5	The prioritized technical descriptors for the customer requirement concern on	8
S. No.	Prioritized customer requirements – Technical Descriptors	prioritized improvement in Vendors selection process [0 – Not at all, 5– Partially, 10 - Completely]
	Reasonable price at highest quality is Competitiveness	

Table 3: Excerpt of the feedback response of the approach

VI. CONCLUSION

The competitive market scenario demands technological innovation as well as delighting the customers (Chen et al. 2006). Accurate translation of customer voice gains more importance. QFD has been widely used for performing this kind of translation (Akao and Mazur, 2003). Very few researches have been reported on the application of QFD forvendors selection process. Vendors selection process is more important in the contemporary industrial scenario as supply chain management is an important concept of advanced manufacturing systems (Hadfield and Nichols, 2006). In this context, this case study has been carried out ina manufacturing organization which is aspiring to attain world class status. The results of the case study have been practically evaluated to explore its implementation feasibility. Based on the generated results it could be claimed that the same approach can be applied to similar manufacturing industries to achieve competency in the process of vendors selection in the industrial scenario

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