

## Weighted Average Score of Customer Needs as Critical Input for QFD

By Javier Santa Cruz-Ruiz, Francisco Tamayo-Enríquez and Verónica González-Bosch

Keywords: QFD, Weighted Averages, Balanced Scorecard

QFD can be conceived as a system to enhance customer satisfaction by incorporating customer expectations since the design of products and services. Therefore, the starting point for QFD is listening to the Voice of Customer (VOC) in order to truly understand him [1]. Two important questions arise at this critical stage: 1) Who really is the customer? and 2) What is the relative importance that the needs extracted from the VOC of different customers may have?

Let us assume that a regional high school decides to listen to the VOC in order to redesign some of its internal processes. In this case, who is the customer? Students? Parents? Teachers? Society? None of the above? From a true systemic view, all of them are customers! All of them have interesting and useful information to provide. On the other hand, the design team shall also address organizational priorities and combine them with the customer priorities [1].

A graphical tool, called Supplier-to-Customer Positioning Map, may be useful to better visualize this situation (Fig. 1). Concentric curves represent the process, being the outermost curve the start of the process, and the innermost the end of the process. The percentage for each level represents the contribution of each sector to the high school Mission accomplishment, as it is later explained. Axis from this chart come from the Six Sigma concept that states that quality occurs when there is a balance between value generated to customer and value generated to supplier [2].

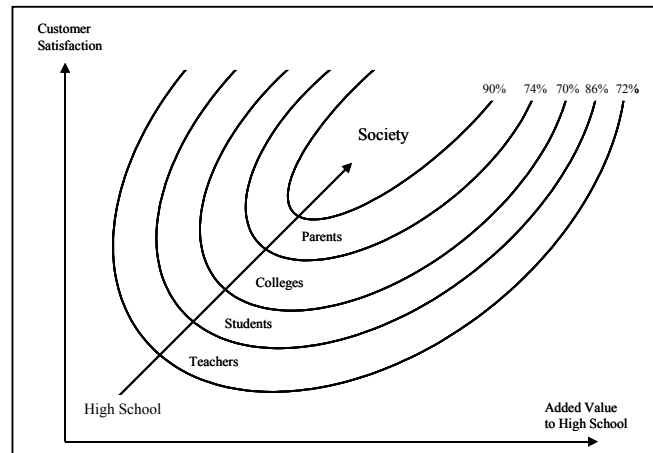


Figure 1. Supplier-to-Customer Positioning Map

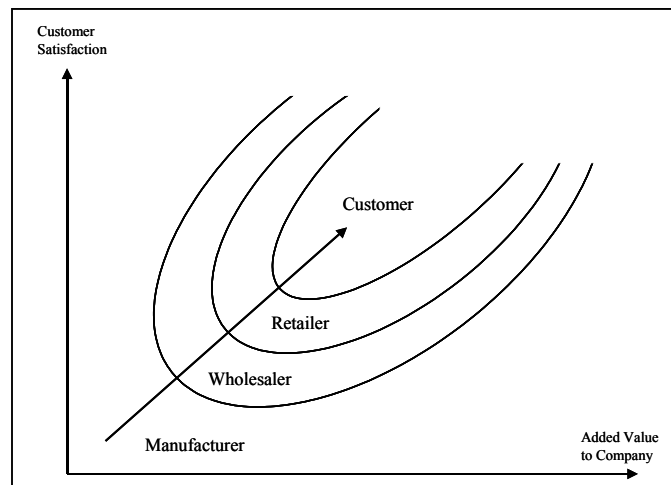
But then, how can we easily assess which customer is more important and determine this percentage? What shall be done in the case that different or even contradictory data are identified? Of course all data are important and shall be considered, so the question is how much weight shall be assigned to the data. Terninko [1] states that the analysis of the customer and their VOC starts with identifying customer segments, their characteristics, and the criteria for prioritizing these segments, and proposes the Analytic Hierarchy Process (AHP), which is an excellent, though rather long, way of making this assessment.

The Weighted Average Score of Customer Needs is a simplified method for balancing the customer needs considering the weight of each customer, providing a fairer structure of needs to

be considered as an input for QFD [3]. Due to its simplicity, we have successfully integrated this method with Blitz QFD, providing a fast alternative to the comprehensive QFD methodology [3]. Although results may have been more modest, this fast success allowed us to demonstrate to QFD-Learning Companies some of the power of QFD that have resulted into more ambitious and resourced comprehensive QFD projects.

The following steps are, as suggested, a complement for the Blitz QFD methodology. To better explain the proposed method, the case of an important world-wide company of the beverage industry established in Mexico is presented. In order to keep the confidentiality about the information of this company, it will be refer to as “Soda Inc.” from now on.

1. **Construct a Supplier-to-Customer Positioning Map.** For example, let consider the marketing channel for consumer goods. Mauser [4] points out that the distribution channel varies greatly depending on the nature of the product, the financial strength of the manufacturer, the number and kind of consumers and the market experience of the firm. In the case of Soda Inc. (Fig. 2), one major channel is Wholesaler-Retailer-Customer. The wholesaler represents the start of the process so it corresponds to the outermost curve; then the retailer and the final customer or final “drinker” goes in the center.



**Figure 2. Supplier-to-Customer Positioning Map - Consumer Goods Marketing**

2. **Transform Voice of the Customer into Prioritized Customer Needs.** By interviewing a representative sample of each level (or customer segment), the objective is to find out their most important needs (out of the VOC). Mazur [3] recommends to limit this to less than 5 customer segments, when doing Blitz QFD. On the other hand, 16 interviews per customer segment shall be enough to detect the most important customer needs, according to the work done by Griffin and Hauser [6].

Based on Blitz QFD [3] the next 5 steps have to be done to achieve this:

- 2.1 Obtain the verbatim of the customer. This refers to the exact words of the customer regarding their needs, wants and complaints.
- 2.2 Sort the verbatim by affinity. This means grouping similar verbatim in order to find out needs.

- 2.3 Structure the customer needs. This means organizing customer needs into a natural structure.
- 2.4 Analyze customer needs structure. This allows to understand the customers' thinking and uncover additional or unstated needs.
- 2.5 Prioritize customer needs. Validating this needs with the customer, by ranking them according to their importance or by AHP with pairwise comparisons[1]. A simple yet useful way of doing so is to ask them to distribute 100 points to the importance of their needs. Statistically representative groups must be addressed. Below is the result of the needs versus the customer segment mean for our example (Table 1).

**Table 1. Prioritized Customer Needs for Soda Inc.**

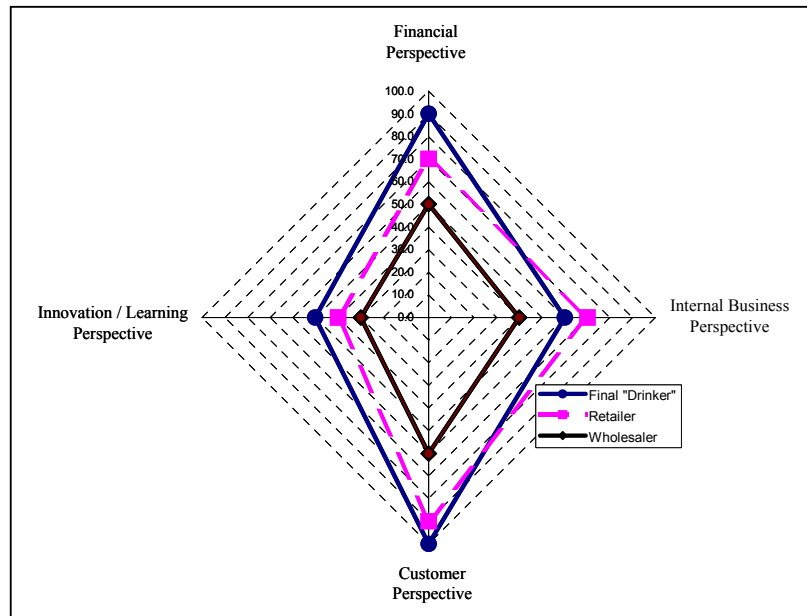
Customer Need	Final "Drinker" Score	Retailer Score	Wholesaler Score
Great Taste	25	5	5
Known Brand name	10	30	25
Smart presentations	15	15	10
Interesting Promotions	5	20	30
Good Appearance	20	15	10
Reasonable Price	25	15	20

- 3. **Identify the contribution of each Customer Segment to the Company Mission.** This may be measured as the impact of each customer segment in the business performance, according to the four perspectives developed by Kaplan and Norton[5]. These authors devised a Balanced Scorecard (BSC), which is a set of metrics that give top management a fast but comprehensive overview of the business. The BSC allows to look at the business from four important perspectives, so an assessment of each customer segment contribution to each one of them can be done.

**a) Customer Perspective:** in which an assessment shall be done in how much the Company Mission is impacted if the company excels its customer service to this specific customer segment; **b) Internal Business Perspective:** which shall assess how much related is this customer segment to the critical internal operations of the company that will allow the accomplishment of the Company Mission; **c) Financial Perspective:** in which an assessment shall be done of the contribution of this customer segment into the bottom-line improvement of the company, as well as its present and future profitability and viability of the Company Mission; **d) Innovation and Learning Perspective:** in which an assessment shall be done of how much this customer segment contributes (or can contribute) to the continual improvement of the existing products and processes, to the introduction of entirely new products with expanded capabilities and, in general, to the learning and intellectual capital development of the company towards the Company Mission [5].

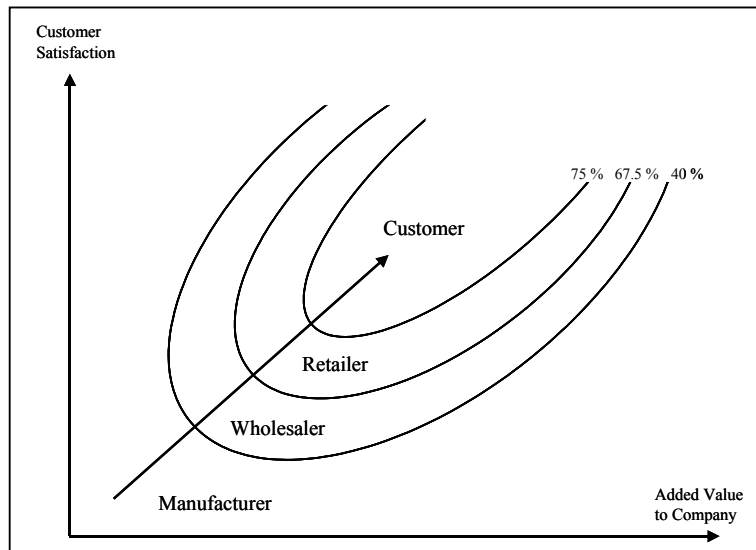
This assessment shall be done by a group of executives and a consensual (rather than averaged) result is preferred. A useful method to do this assessment is to classify the critical metrics of the company (3 or 4 per perspective, keeping the same number per category) and afterwards evaluate the impact on those by each customer segment been analyzed.

The contribution of each customer segment to the Company Mission is the average of the percentages of each four perspectives from the point of view of the Company, as a result of an interactive meeting from the executive managers of Soda Inc. as shown in Figure 3.



**Figure 3. Contribution to Company Mission**

These results can be added to the Supplier-to-Customer Positioning Map (Fig. 4).



**Figure 4. Supplier-to-Customer Positioning Map - Consumer Goods Marketing**

4. **Calculate the matrix for each result.** Here, the matrix of customer needs is weighted according to the customer segment contribution to the Company Mission (Table 2). These contributions were named Customer Segment Weight (CSW<sub>i</sub>) for the i-th customer segment. The resulting Weighted Scores (WS<sub>ij</sub>) represent the score for the j-th need, weighted by the i-th customer segment:  $WS_{ij} = \text{Score}_{ij} \times CSW_i$

**Table 2. Average Weighted Score of Customer Needs for Soda Inc.**

Customer need	Final “Drinker” (CSW <sub>1</sub> = 75.0%)		Retailer (CSW <sub>2</sub> = 67.5%)		Wholesaler (CSW <sub>3</sub> = 40.0%)	
	Score <sub>1j</sub>	WS <sub>1j</sub>	Score <sub>2j</sub>	WS <sub>2j</sub>	Score <sub>3j</sub>	WS <sub>3j</sub>
Great Taste	25	18.75	5	3.38	5	2.00
Known Brand name	10	7.50	30	20.25	25	10.00
Smart presentations	15	11.25	15	10.13	10	4.00
Interesting Promotions	5	3.75	20	13.50	30	12.00
Good Appearance	20	15.00	15	10.13	10	4.00
Reasonable Price	25	18.75	15	10.13	20	8.00

The final Customer Need Table (Table 3) is generated by averaging the Weighted Scores (WS). Since the addition of the customer segments is usually less than 3 (for Soda Inc. case .75, .675 and .40), each Weighted Average Score for the j-th need shall be calculated as:

$$\text{Weighted Average Score}_j = \frac{\text{Weighted Score Sum}_j}{\text{Customer Segments Weight Sum}} = \frac{WS \text{ Sum}_j}{CSW \text{ Sum}}$$

$$\text{Soda Inc. Weighted Average Score}_j = \frac{WS \text{ Sum}_j}{(0.75 + 0.675 + 0.40)} = \frac{WS \text{ Sum}_j}{1.825}$$

**Table 3. Final Customer Needs Table for Soda Inc.**

Customer Need	WS Sum <sub>j</sub> = (WS <sub>1j</sub> +WS <sub>2j</sub> +WS <sub>3j</sub> )	CSW Sum = (W <sub>1</sub> +W <sub>2</sub> +W <sub>3</sub> )	Weighted Average Score <sub>j</sub> = WS Sum <sub>j</sub> / CSW Sum	
Great Taste	24.13	0.750+0.675+0.400 CSW Sum = 1.825	24.13 / 1.825 =	13.22
Known Brand name	37.75		37.75 / 1.825 =	20.68
Smart presentations	25.38		25.38 / 1.825 =	13.90
Interesting Promotions	29.25		29.25 / 1.825 =	16.03
Good Appearance	29.13		29.13 / 1.825 =	15.96
Reasonable Price	36.88		36.88 / 1.825 =	20.21

5. **Deploy prioritized customer needs.** Consider these scores for providing the input to complete the House of Quality (HoQ), Customer Voice Table [3] or simply to translate these needs into design parameters so that they can be addressed for improvement.

Finally, the result of a short mathematical simulation is presented in order to show what would have happened if the proposed method would not have been used, in order to oversee the complete scenario and analyze the improvement ratio against AHP (Equation 1). This was also compared with a traditional AHP (considering each BSC criteria as equally weighted). Since the AHP is recognized as a very good method to conduct assessments, the differences against the AHP were also compared, considering it as the “optimal solution” (Table 4).

**Table 4. Mathematical Simulation for Soda Inc.**

Customer Need	Analytic Hierarchy Process (AHP)	Plain Average		Weighted Average Score	
		(distance to AHP)		(distance to AHP)	
Great Taste	13.00	11.67	1.33	13.22	0.22
Known Brand name	20.20	21.67	1.47	20.68	0.48
Smart presentations	13.80	13.33	0.47	13.90	0.10
Interesting Promotions	16.40	18.33	1.93	16.03	0.37
Good Appearance	15.80	15.00	0.80	15.96	0.16
Reasonable Price	20.20	20.00	0.20	20.21	0.01
		<b>Average distance<sub>1</sub></b>	<b>1.03</b>	<b>Average distance<sub>2</sub></b>	<b>0.22</b>

**Equation 1. Improvement Ratio for Soda Inc.**

$$Improvement\ ratio = 1 - \frac{Average\ Distance_2}{Average\ Distance_1} \times 100 = 1 - \frac{0.22}{1.03} \times 100 = 78.30\%$$

**Conclusion**

This five-step process of pondering the customer needs evaluated by different segments provides an objective balance which can provide focus when the same product or service is to be shared among different users. The Supplier-to-Customer Positioning Map allows to validate current distribution channels. The contribution of each customer segment to the Company Mission, develops a synergetic interaction with their customers. The final matrix enhances the understanding of the customer’s needs and expectations.

The process also prevents the risk of giving excessive power to a given group, risking the satisfaction of other customers.

As this method is relatively simple to process with any worksheet or even with a calculator, it provides a fast alternative to a pairwised-comparison AHP, and can be used for initial QFD and Blitz QFD projects, without generating significant discrepancies in most cases.

**References**

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