SIX SIGMA

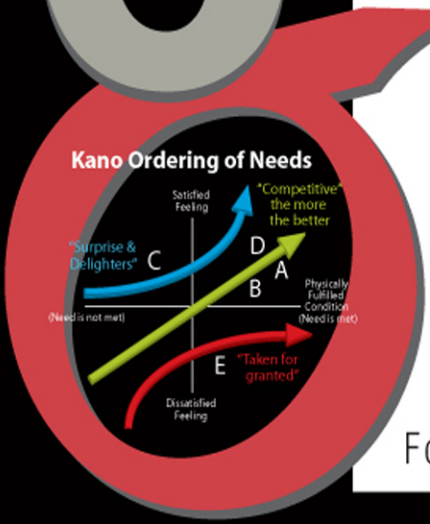
"Joe Ficalora has done an excellent job of updating Cohen's classic text on Quality Function Deployment to show how Six Sigma tools can be effectively used in applying the QFD methodology and how valuable QFD can be in Design for Six Sigma projects. I highly recommended it to practitioners of both disciplines. They will be well rewarded by using this book to guide them in delighting their customers."

—**John L. Schoonover**, Director of Quality, Global Tungsten and Powders

Quality Function Deployment and SIX SIGMA

A QFD Handbook

Second Edition



Foreword by Stephen A. Zinkgraf

JOSEPH P. FICALORA • LOUIS COHEN

Praise for *Quality Function Deployment and Six Sigma*

"Joe Ficalora has done an excellent job of updating Cohen's classic text on Quality Function Deployment to show how Six Sigma tools can be effectively used in applying the QFD methodology and how valuable QFD can be in Design for Six Sigma projects. I highly recommended it to practitioners of both disciplines. They will be well rewarded by using this book to guide them in delighting their customers."

—John L. Schoonover
Director of Quality
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Improving a Classic

"For good reasons, the saying 'Don't mess with success' applies to many things in life; thus Lou Cohen and Joe Ficalora have accomplished a feat often fraught with risk. The original book on QFD, by Lou Cohen, was excellent, with ideas and detailed examples for applying QFD to many types of problems. The new edition builds on the original by integrating material on Design for Six Sigma, making it highly likely that it will remain a key reference. Whether you are working on developing a new product or a transactional business process, this updated edition will help you focus your efforts on what customers really want and need—so important to delivering something customers will pay for."

—John P. King
Jewett & King Associates

The answers to these questions combine to create a prioritization or rank ordering of the Customer Needs and Benefits.

One reason to complete the Planning Matrix immediately after the Customer Needs and Benefits are completed is because once customer needs are prioritized, the QFD team may choose to restrict its analysis to only the highest-ranking customer needs. This considerably reduces the time required to complete the QFD process. If the Planning Matrix were postponed until another time, say after the Relationships step was filled in, the development team would not be able to restrict its analysis, since it would not know which customer needs were most important.

Some practitioners generate the Technical Response Priorities and even determine the Relationships before developing the Planning Matrix. An advantage to this sequence is that team members will be required to become extremely familiar with the customer needs in order to generate the Technical Response Priorities. Hence, they will be that much better prepared to do the goal setting and high-level analysis in the Planning Matrix when they get to it.

5.1.3 The Third Step

The third step in completing the HOQ to complete is Technical Response Priorities. This can be thought of as a set of product or process requirements, stated in the organization's internal language. Sometimes they are called **corporate expectations**, to distinguish them from the **customer expectations**. A variety of different types of information may be placed here. The most common alternatives are

- Top-level solution-independent measurements or metrics
- Product or service requirements
- Product or service features or capabilities

Whichever type of information is chosen, we call it Substitute Quality Characteristics (SQCs). Just as the Customer Needs and Benefits represent the Voice of the Customer, the SQCs represent the Voice of the Developer. By placing these two voices on the left and top of the matrix, we will be able to systematically evaluate the relationships between them.

Whether teams use measurements, requirements, or features as their SQCs depends on the design methodology of their organization. Some organizations prefer a structured design process in which the design is first expressed very abstractly or independently of the ultimate design. It is then progressively (more concretely) developed in a series of steps in a process sometimes referred to as **stepwise refinement**. This approach is

particularly favored by software engineers. Other organizations are more comfortable creating a concrete design of the product or service at the earliest possible moment. In fact, many organizations conceive of the design before they assess customer or market needs. These differences in style are all compatible with QFD and can be handled by "Static/Dynamic" analysis, as described in Chapter 13, Section 13.2.1.

Regardless of which type of SQC is placed along the top, the amount of detail may need to be managed in much the same way that the amount of customer detail needs to be managed. When there is a great deal of detail, the SQCs can be arranged hierarchically by means of the Affinity Diagram process, followed by the Tree Diagram process, as in Figure 5-2. The hierarchy gives the QFD team some freedom to conduct the analysis at a high or low level of detail by choosing the Primary, Secondary, or Tertiary level of the hierarchy. The higher the level, the smaller the Relationships step; the lower the level, the more detailed the analysis.

5.1.4 THE FOURTH STEP

The fourth step is to complete the Relationships step of the House of Quality. This is the largest step of the matrix, and therefore represents the largest volume of work. Various shortcuts are possible, which we'll discuss later in the book. This step uses the Prioritization Matrix method. For each cell in the Relationships step, the team enters a value that reflects the extent to which the SQC (at the head of the column) contributes to meeting the customer need (to the left of the row). This value, along with the prioritization of the Customer Needs and Benefits, conprises the contribution of the SQC to overall customer satisfaction. We'll discuss the details of computing the contribution in Chapter 8.

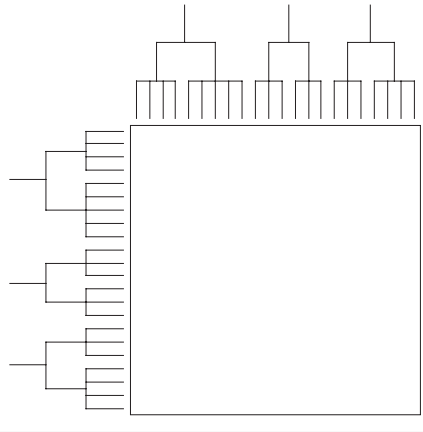

Figure 5-2 Tree Diagrams on the Left and on the Top

Once the contributions of all SQCs have been computed, the SQCs are essentially prioritized. Those with greatest overall impact on customer satisfaction are most important. This fundamental result is one of the most important outcomes of using QFD.

5.1.5 The Fifth and Sixth Steps

Some QFD teams, especially those working in less-disciplined environments, abandon QFD after the Relationships step, and use the priorities of the SQC to plan later stages of the development project.

Other teams next use the prioritization of the SQCs to provide guidance about further HOQ product-planning activities. These activities are Competitive Benchmarking and Target Setting, the fifth and sixth steps in completing the HOQ. They occupy the bottom two lines of the HOQ, labeled Competitive Technical Benchmarks and Technical Targets in Figure 5-1. Competitive Technical Benchmarks and Technical Targets are normally expressed in language compatible with the language of the SQCs.

5.1.6 The Seventh Step

The seventh and usually final step in completing the House of Quality is to fill in the Technical Correlations matrix (the "roof"). This matrix is used to record the way in which SQCs either support or impede each other. This information helps QFD teams to identify design bottlenecks, and it helps them to identify key communication paths among designers.

This completes our overview of the House of Quality. In Chapter 6, we'll begin looking at each of the steps more closely.

5.2 Summary

We've just completed a tour of the House of Quality. The HOQ matrix acts as a repository of marketing and product-planning information. The key inputs to the matrix are customer wants and needs, product strategy information, and Substitute Quality Characteristics (a high-level formulation of product or service requirements). Other information that can be placed in the HOQ includes product benchmarking data and target values.

The HOQ contains many steps or "rooms," each of which can and should be customized by the development team to meet its needs. While various sequences for working on the steps each have advantages, the team must consciously choose a sequence, and plan its work accordingly.

The most strategic judgments the team must make are in the Planning Matrix. Here the team sets customer-satisfaction goals, which have the effect of combining the company's business objectives with the customer's priorities.

Another step of the HOQ, the Technical Response Priorities, contains high-level product or service requirements. The Relationships step entails mapping how the elements of the Technical Response Priorities relate to meeting customer needs, and hence to overall customer satisfaction.

The Technical Correlations step ("the roof") of the HOQ is used to analyze relationships among elements of the Technical Response Priorities.

The step below Relationships contains the priorities of the technical-response elements, along with a roadmap for competitive benchmarking and target setting.

We're now ready to drop down to another level of detail and discuss the steps of the House of Quality one by one. The first will be Customer Needs and Benefits.

5.3 Discussion Questions

- Identify which information normally used for the HOQ was actually used in a recent product planning activity that you participated in.
- Did you use information beyond the data required for the HOQ?
- How could you customize the HOQ to include this extra information?

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6 Customer Needs and Benefits Section

This chapter describes how QFD represents the Voice of the Customer (VOC). As mentioned in Chapter 1, there are several different groups from whom to collect voices for various aspects of product, process, and technology design; however, the voice collection and processing methods remain the same. We will treat them all as VOC for the purposes of this chapter. As a reminder to the reader, customer satisfaction is of paramount importance. To that end, only true customer needs may be satisfied, but not really voices. Hence the reader is reminded to fully analyze each customer focus segment VOC to discern the true customer needs that will be satisfied and the priority order, or hierarchy, of those needs. The ultimate metric is customer satisfaction, which fundamentally determines the longevity of every business venture.

In QFD, one of the hardest aspects is to properly relate the Voice of the Developer (VOD) to the VOC. In this chapter we will explore Substitute Quality Characteristics (SQCs). SQCs are those measures the developers manage during development of the products and services. SQCs in essence represent the customer by proxy from their relationships to the VOC developed by analyzing customer needs and completing the HOQ. In order to understand the VOC representation, we'll discuss how the VOC is collected and analyzed. The main steps are:

- Prepare for and conduct customer visits. Listen to the customer and capture the customer's unstructured words and images that are of use in the customer's environment.
- An image of a customer struggling with packages (see Figure 6-1) suggests a need, whether voiced or unvoiced. Describing an image like this, of use in the customer's environment, is what customer images are all about (see Figure 6-2).