QUALITY FUNCTION DEPLOYMENT APPROACH TO SATISFYING CUSTOMER'S DEMANDS AND AN IMPLEMENTATION AT SHOES COMPANY

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ABSTRACT

In our developing world, to produce high quality product and deliver these products to the customers are carried on. From this point of view, producing quality products is very important for the continuity of business companies. In manufacturing systems, considering customer demands means broadening market share. Customer demands are valid from designing product to the services. If the business enterprise completes these processes it will be called successful. To reflect the customer demands to the product, we use a technique called Quality Function Deployment.

In this study, some basic definitions of the Quality Function Deployment are given and initial data for the implementation will be expressed.

1. WHAT IS QUALITY FUNCTION DEPLOYMENT

When first approached about Quality Function Deployment most managers question what it is. Quality Function Deployment, or QFD as it is commonly known, is a process that provides structure to the development cycle. This structure can be likened to the framework of a house. The foundation is customer requirements. The frame consists of the planning matrix, which includes items such as the importance rating, customer-perceived benchmarking, sales point, and scale-up factors. The second floor of the house includes the technical features. The roof is trade-off of technical features. The walls are the interrelationship matrix between the customer requirements and the technical characteristics. Other parts can be built using things such as new technologies, functions, technical characteristics, processing steps, importance ratings, competitive analysis, and sales points. The components utilized are dependent upon the scope of the project (3).

The thing that makes QFD unique is that the primary focus is the customer requirements. The process is driven by what the customer wants, not by innovations in technology. Consequently, more effort is involved getting the information necessary for determining what the customer truly wants. This tends to increase the initial planning time in the project definition phase of the development cycle, but it reduces the overall cycle time in bringing a product to market. This is illustrated in Figure 1. When a product is conceived, the primary focus is on who the customer is, since the customer sets the stage for all the work. What the customer wants will determine whether new technologies are needed, whether simple improvements are possible, or whether a revolutionary concept is required. Success in determining customer requirement is directly related to success in the marketplace. This is critical to the whole process.
2. TOTAL QUALITY MANAGEMENT (TQM) AND QFD

The six key concepts of TQM, that is (2):

- Customers (external and internal),
- Never-Ending Improvement,
- Control of Business Process,
- Upstream preventive management,
- Ongoing Preventive Action,
- Leadership and Teamwork,

Customer is always in the first position. In addition to Quality in the development phases refer not just to the product but also to the service. Indeed, Quality Equals Customer Satisfaction is intended to underline the notion that it is not sufficient to simply respond to the customer's requests. In addition to that type of quality (expressed quality) there is also implicit quality (quality that is not specifically asked for but is assumed to be there), and attractive quality (quality that is not asked for because the customer does not even imagine that it can exist). This is the area of dormant needs.

QFD gives the fullest possible depth to the quality concept and ensures performance capable of satisfying the customer in the most complete sense.

3. BENEFITS OF QFD

What are the benefits of using QFD? Since QFD is a customer-driven process, it creates a strong focus on the customer. QFD exercises tend to look beyond the usual customer feedback and attempt to define the requirements in a set of basic needs, which are compared to all competitive information available. Therefore, all competitors are evaluated equally both from the customer's perspective and from a technical perspective. Once this information is in hand, then, through a Pareto ranking, the requirements are prioritized, and the manager can then effectively place resources where they can do the most good-on the requirements that are meaningful to the customer and that can be acted upon (3).

Another benefit of QFD is that it structures experience formation into a concise format. In many companies, there is a wealth of information available but not put together in a document. QFD places that information into a structured format that is easy to assimilate. This information contains all necessary rationale for choosing the design, identifying trade-offs, listing future enhancements. This is important for the times when there are personnel who leave the project and new people are brought on board, as the documentation allows for the swift
integration of ideas and progress. QFD is also flexible enough to adapt to new information, since the matrix structure will grow or shrink based on the information received. In essence, QFD produces a living document, one that reacts to input and better defines real needs. Figure 2 summarizes the benefits of QFD (3).

<table>
<thead>
<tr>
<th>CUSTOMER DRIVEN</th>
<th>Reduces implementation time</th>
<th>Promotes teamwork</th>
<th>Provides documentation</th>
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</thead>
<tbody>
<tr>
<td>Creates focus on customer requirements</td>
<td>Decreases midstream design change</td>
<td>Consensus based</td>
<td>Documents rationale for design</td>
</tr>
<tr>
<td>Uses competitive information effectively</td>
<td>Limits post-introduction problems</td>
<td>Creates communication at interfaces</td>
<td>Is easy to assimilate</td>
</tr>
<tr>
<td>Prioritizes resources</td>
<td>Avoids future development redundancies</td>
<td>Identifies actions at interfaces</td>
<td>Adds structure to the information</td>
</tr>
<tr>
<td>Identifies items that can be acted upon</td>
<td>Identifies future application opportunities</td>
<td>Creates global view out of details</td>
<td>Adapts to changes, a Living Document</td>
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<td>Structures resident experience/information</td>
<td>Surfaces missing assumptions</td>
<td>Provides framework for sensitivity</td>
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Figure 2: QFD Benefits.

4. QUALITY DEPLOYMENT IN PLANNING AND DESIGN

QFD makes it possible to (7),
- Define product specifications meeting customer requirements while attending to the competition.
- Ensure consistency between customer requirements and the product's measurable characteristics, assemblies, components, and materials.
- Instill in all company members an understanding of the relation between their individual contribution and characteristics of the finished product, and between the product and the market.
- Ensure consistency between the planning and the capability of the production process.
- Speed up the production process because planing takes place at an early stage, thus minimizing mistaken interpretations of priorities and objectives.

In the field of QFD a distinction is made between quality deployment and quality function deployment. Quality deployment refers to the final quality and service that a product offers. Quality function deployment refers to the company function involved in product development. Figure 3 indicates that by building quality into the development stages -from planning and design through manufacturing and service- the measurable features of quality in the final product will be improved.
Quality Function Deployment

1. Complete and correct perception of the needs and requirements of the customer, where the end user primarily, but also all internal or external handlers situated between the development phases and the end user.
2. Complete and competent translation of customer requirements into product specifications.
3. Planning, design, and assignment of specifications for the product's individual details.
4. Upgrading and development of technologies and processes to obtain the product thus planned - that is, translation of product characteristics to processes characteristics.
5. Definition of the specific operational conditions (SOP) and procedures that must be constantly applied in the production phase.
6. Production.
7. Definition of the performances and functions of the product and instructions for its use.

The management of these processes has traditionally focused on the conformity of the finished product to redefined specifications. This orientation produces a slew of quantitative data aimed toward defining quality characteristics and production criteria. In a process that requires competence and precision at every stage, however, there are areas in which the quality-codification forms are too ill-defined.

Difficulties in new-product development can be traced to the following causes:

1. Lack of comprehension of customer needs and wishes. This happens because customers generally express their desires in an unclear, fragmentary manner. Additionally, they often have vague, unexpressed, or unformulated wishes.
2. Faulty translation of orally expressed needs into numerical expression that make up a product.

Figure 3: Quality Deployment as Part of QFD.

5. QUALITY PROCESS AND PROBLEMS IN NEW-PRODUCT DEVELOPMENT

Seven phases in logical and temporal sequence can be distinguished:

- Complete and correct perception of the needs and requirements of the customer, customer here meaning primarily the end user but also all internal or external handlers situated between the development phases and the end user.
- Complete and competent translation of customer requirements into product specifications.
- Planning, design, and assignment of specifications for the product's individual details.
- Upgrading and development of technologies and processes to obtain the product thus planned - that is, translation of product characteristics to processes characteristics.
- Definition of the specific operational conditions (SOP) and procedures that must be constantly applied in the production phase.
- Production.
- Definition of the performances and functions of the product and instructions for its use.
- In complete transfer of information from the beginning of the chain (marketing, etc.) to the end (production, etc.).
- Other problems, these include problems of quantitative translation, of identification of criticality and priority, and of comparison with products of the competition.
All this results in,
- Insufficient understanding of the quality required by the customer.
- Emphasis on quality characteristics that are wrongly considered important.
- Sampling and other conditions of testing for incorrect qualitative appraisals.
- Delegation to planning technicians of important decisions relating to the product.
- Little understanding by the planner of the critical production engineering issues.
- Insufficient time to perform quality checks throughout product development.

QFD provides the technique for avoiding and overcoming these problems.

6. THE TEN PHASES OF QFD

The frameworks of QFD consist of certain basic activities, techniques, and instruments. This framework has undergone expansion in the course of time; furthermore, every company that has introduced QFD has tailored the system to its own specific demands.

The role of QFD in new-product development is shown schematically in figure 4 (7). The “quality table” is a kind of meeting place for customer requirements, production capacity, and all comparisons and parameters needed to develop new products successfully.
• Deployment of quality characteristics,
• Quality and characteristics correlation,
• Numeric values,
• Deployment of quality functions,
• Deployment of the subsystems,
• Detailed design,
• Production process,
• Standard operation procedure,
• Quality control,

7. THE QFD SYSTEM

Figure 5 shows a generic flow of the QFD system model. The value of this model is that it shows the integration of the various quality tools with a set of deliverables using QFD as the framework (3).

The cornerstone of the system is the Customer Requirements and Engineering/Technical Feature matrix. Using these all other matrices and studies are generated. Next matrix shows the Engineering Features and the Applied Technologies. These two matrices result in a Customer Needs Document, a Concept Document, an assessment of the technical requirements, and the identification of trade-offs.

Once the concept is approved, the next matrix looks at the applied technologies and the manufacturing steps. The next matrix looks at the Manufacturing Process Steps and the Manufacturing Quality Control (QC) Steps. Then one can start his/her Statistical Process Control (SPC) implementation and run capability studies, as well as continue any experimentation started earlier. The next matrix looks at the Manufacturing QC steps and the Process SPC parameters. This can be considered a check to ensure that the right process variables are being used. The final matrix in the flow looks at the Process SPC parameters and the Final Customer Specifications.

Using this flow model, managers can see the potential strengths in utilizing QFD. As the project progresses, other matrices may be utilized to better clarify requirements. The advantage of the model is to show how the QFD flows from design concepts to a manufactured product. This process aids the difficult transition of bringing a product from development to manufacturing. It also brings all the necessary information to manufacturing so that the line operator is capable of running the process as necessary to produce the highest quality product.

8. THE QFD STUDY

QFD study has been started at a sport shoes company as a trial application. The aim of the this study is to know customer demands and produce the products, which satisfy customer demands, in the competitive market for this reason, a query is performed to find out customer demands. Results are given figure 6.

According to these results, the first step of the QFD is realized. The competitive firms will be analyzed and QFD study will be completed.
Figure 5: QFD System Flow Model

- Sole of the shoe must be well
  - Must be soft
  - Must be colorfit
  - Must be orthopedics

- Machine sewing must be well
  - Sewing not to be absorb water
  - Thread not to be broken out
  - Thread not to be lost its strength

- Shoe must be comfortable
  - Not to be chafed from the back
  - Not be chafed from toe cup
  - Not be chafed from the apron

- Leather quality Must be well
  - Footwear upper must be rough
  - Dye must be well

- Well appearance
  - Must be esthetics
  - Must be eye-catching

Figure 6: Customers Demand For The Sport Shoes
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