Quality Functional Deployment (QFD)

QFD – Definition

- "Planning tool used to fulfill customer expectation"

- Team Based
  - Cross Functional

- Voice of the Customer
  - Expectations
  - Requirements

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Uses

- Product Planning
- Part Development
- Process Planning
- Production Planning
- Service Industries

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Benefits

- Improved Customer Satisfaction
  - Identifies Basic Needs (Customer Requirements)
  - Focus on areas where most improvement is needed
- Reduces Implementation Time
  - Decrease design changes
- Promote Teamwork
- Provides Documentation
  - Data for future designs

- Figure 12-1 pp. 318

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Information Sources

- Customer Information comes from a combination of three pairs of sources
  - Solicited or Unsolicited
  - Quantitative or Qualitative
  - Structured or Random
- Figure 12-2 pp. 320
- Use an Affinity Diagram (Chp. 17)
  - Organizes information into logical groups

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Construction of the House

- QFD is also called the “House of Quality”
  - Because it looks like a house
    - Walls
    - Roof
    - Ceiling
    - Floor
    - Interior
- Like any house construction, following the plans (steps) correctly will result in a good strong house (Quality).

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Plans (Steps)

- Sevens Steps to Constructing the House of Quality

1. List Customer Requirements (WHATs)
2. List Technical Descriptors (HOWs)
3. Develop a Relationship Matrix between WHATs and HOWs
4. Develop the Interrelationship Matrix between HOWs
5. Competitive Assessment
6. Develop Prioritized Customer Requirements
7. Develop Prioritized Technical Descriptors

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 1

- List Customer Requirements (WHATs)
- What are they
  - Customer Expectations or Requirements
    - Primary (Broad)
    - Secondary (Narrow)
    - Tertiary (Very Specific) (May not be necessary)
- Why is it important
  - Basis for everything which comes after
  - Miss this and product/service will not be successful

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 2

- List Technical Descriptors (HOWs)
- What are they
  - Characteristics which affect the WHATs
    - Primary (Broad)
    - Secondary (Narrow)
    - Tertiary (Very Specific) (May not be necessary)
- Why is it important
  - Translates the Customer Language in Technical Language

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 3

- Develop a Relationship Matrix between WHATs and HOWs
- What is it
  - Strength of relationship between specific WHATs and HOWs
    - +9 Strong (Symbol: ●)
    - +3 Medium (Symbol: ○)
    - +1 Weak (Symbol: Δ)
    - 0 Not Applicable (No Symbol)
- Why is it important
  - Determine trade-offs between conflicting characteristics
  - Determines absolute weight at the bottom of the house

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 4

- Develop the Interrelationship Matrix between HOWs (Correlation Matrix)

- What is it
  - Strength of relationship between specific WHATs and HOWs
    - +9 Strong Positive (Symbol: ●)
    - +3 Positive (Symbol: ○)
    - -3 Negative (Symbol: X)
    - -9 Strong Negative (Symbol: *)

- Why is it important
  - Determine which HOWs support each other and which are in conflict
  - Identify points where trade-offs must be made

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 5

- Competitive Assessment
- What is it
  - How you rank on the WHATs compared to your competitors
  - How you rank on the HOWs compared to your competitors
    - Each is on a scale 1 (worst) – 5 (best)
  - Must be congruence between WHATs and HOWs
- Why is it important
  - Determine if customer requirements are being met
  - Focus on areas of needed improvement

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 6

- Develop Prioritized Customer Requirements
- What is it
  - Provides Absolute Numeric values to WHATs
    - Importance to the customer
      - Each is on a scale of 1 (least) – 10 (most)
    - Target Value
      - Each is on a scale 1 (worst) – 5 (best)
    - Scale-up Factor
      - How much improvement is necessary to get to the Target Value (Calc)
    - Sales Point
      - Each is on a scale of 1.0 (lowest) – 2.0 (highest)
    - Absolute Weight
      - Calculation

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 6

- Develop Prioritized Customer Requirements (Cont.)
- Where does the data come from
  - Customer
    - Focus Groups
- Why is it important
  - Determines guide for the planning phase of product development

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Step 7

- Develop Prioritized Technical Descriptors
- What is it
  - Provides objectives for subsequent designs and means to objectively assess progress and minimize subjective opinions on the HOWs.
    - Degree of Difficulty
      - Each is on a scale of 1 (least) – 10 (most)
    - Target Value
      - Each is on a scale 1 (worst) – 5 (best)
    - Absolute Weight
      - Calculation
    - Relative Weight
      - Calculation

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Process

- Develop Prioritized Technical Descriptors (Cont.)
- Why is it important
  - Higher weight values point to areas where efforts need focusing
- Absolute Weight
  - $a_j = \sum_{i=1}^{n} R_{ij} c_i$ (Error in Book pp 341; m should be j)
- Relative Weight
  - $b_j = \sum_{i=1}^{n} R_{ij} d_i$

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Process

- Phase I
  - Product Planning
- Phase II
  - Part Development
- Phase III
  - Process Planning
- Phase IV
  - Production Planning
- HOWs from the previous Phase become WHATs in the next Phase

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed

QFD – Conclusion

- Orderly way to obtain and present information
- Shorter product development cycle
- Considerably reduced start-up costs
- Fewer engineering changes
- Reduced chance of oversight in design process
- Environment of teamwork
- Consensus decisions
- Everything is preserved in writing

Source: Besterfiled et al, (2003). Total Quality Management. 3rd Ed