Translating Customer Expectations with Quality Function Deployment (QFD)

Sheryl Vogt
Vogt Consulting, Inc.
April 24, 2013
Agenda

• Welcome

• Introduction of MBB Webcast Series
  - Larry Goldman, MoreSteam.com

• Today’s Session
  - Sheryl Vogt, Vogt Consulting

• Open Discussion and Questions
MoreSteam.com

• Founded in 2000
• Trained 400,000 Lean Six Sigma professionals
• Served over 2,000 corporate customers (including 50+% of the F500)
• First firm to offer the complete Black Belt curriculum online
• Courses reviewed and approved by ASQ and PMI
• Academic Partnerships with Ohio State University, Cal Poly and George Washington University
Today’s Presenter

Sheryl Vogt
President, Vogt Consulting, Inc.

- Develops and delivers LSS programs and training for manufacturing, service, healthcare, and government organizations.
- Mentored hundreds of Black and Green Belts on their projects.
- Previously worked as a Black Belt and Master Black Belt for GE.
- B.S. in Mechanical Engineering and M.S. in Industrial Engineering – Purdue University
Today’s Topic – Simple QFD

• Quality Function Deployment (QFD) is a complex but powerful tool that is used for product development

• Today we will focus on a simplified version that can be used for process design
QFD Simplified for Process

• History and purpose of Quality Function Deployment (QFD)

• Simplified version that can be used for process design

• Some examples
History of QFD

• Developed in the 1960’s by two professors in Japan

• Purpose was to design customer satisfaction into products

• Refined in 1970s

• Caught on in the US in the 1980’s and 90’s for product design
Quality Function Deployment (QFD) is recognized for the matrix which translates customer requirements (the voice of the customer) into technical requirements.

The matrix is often referred to as the “house of quality”.

The “House of Quality”
Why is QFD Good?

It’s a Translation Tool
Translating Customer Requirements

Customer Needs

Customer Requirements

Functional Requirements

Design Specs

Process Specs

Produce
Customers are Hard to Understand

Hello Class! ... This is the formula for a triangle.

\[ E = MD \pi 2x^2 + 3 \text{eggs} \]

\[ \frac{x + \frac{1}{2}}{2} - \frac{37^3}{x - \theta} \]

\[ GQ = \frac{37}{0.5} = \$ 0.5 \]

\[ + \frac{3}{4} \text{ of } \frac{2x}{6} \text{ pills} \]
Great Tool but……

• Very long and tedious method

• Correct application requires rigor and time

• Hard to translate from product to process
Typical Team Reaction

Had this experience?
Adapting Tools to our Needs

• QFD is a great tool for product development or even complex process development

• Most of us spend more time on small pieces of internal processes
Simplified Approach

• What if we could apply the idea in a much simpler way?

• Translate customer requirements without confusing our teams

• Let’s make the tool work for us, not us working for the tool
QFD is actually more than one matrix. It is a whole process of translating customer requirements into specifications.
QFD is actually more than one matrix. It is a whole process of translating customer requirements into specifications.
Components of the House of Quality

1. Identify Customer Needs
2. Competitive Comparison of Customer Ratings
3. Measurable Customer Requirements
4. Correlations
5. Calculated Importance
6. Competitive Benchmarks
7. Target Limits
8. Measurement Conflicts
1. Identify Customer Needs
2. Competitive Comparison of Customer Ratings
3. Measurable Customer Requirements
4. Correlations
5. Calculated Importance
6. Competitive Benchmarks
7. Target Limits
8. Measurement Conflicts
Similar to C&E but Not Quite

<table>
<thead>
<tr>
<th>WHATs - Customer Needs</th>
<th>HOWs - Product Features</th>
<th>Importance: 5: High, 1: Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature Raw Score</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td></td>
</tr>
<tr>
<td>Feature Rank</td>
<td>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>Target</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Critical Elements

### WHATs - Customer Needs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Feature Rank</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### HOWs - Product Features

<table>
<thead>
<tr>
<th>Feature Raw Score</th>
<th>Feature Rank</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Critical</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Critical</td>
</tr>
</tbody>
</table>

Importance: 5 High, 1 Low

[MoreSteam.com](https://www.MoreSteam.com)
Focus Today

**Needs** – Something a Customer would say they wanted – you could hear this coming from a customer’s mouth

**Requirements** – Something measurable – you can tell how you are doing in comparison – but generic – doesn’t imply a solution

**Specifications** – Something measurable from a specific design or process – design parameters and process parameters
Examples

Service is a Call Center

Product is a Pencil

Responsiveness

Minutes on Hold

Automatic Roll-Over

Rollover in 2 Min

Easy to Erase

Pressure to Erase

Eraser

Eraser (Softness)
Eraser Holder (Tension)
<table>
<thead>
<tr>
<th>WHATs - Customer Needs</th>
<th>Feature Raw Score</th>
<th>Feature Rank</th>
<th>Target</th>
<th>Importance: 5 High, 1 Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0 0 0 0 0 0 0 0</td>
<td>0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td></td>
<td>1 1 1 1 1 1 1 1 1</td>
<td>1 1 1 1 1 1 1 1 1</td>
<td>1 1 1 1 1 1 1 1 1</td>
<td>1 1 1 1 1 1 1 1 1</td>
</tr>
</tbody>
</table>
What are Customer Needs

• A complete set of customer wants and needs
• Expressed in their own language
• Organized into a hierarchy
• Prioritized by importance and current performance or satisfaction

Voice of the Customer is both qualitative and quantitative
Capturing Customer Needs

- Look for existing information
  - Historical data
  - Complaints
  - Standards and Regulation
  - System specifications

- Conduct Surveys

- Conduct Team Meetings and Focus Groups

- Conduct individual interviews

Do you know what data you already have?
Mixed messages

Laptop wish-lists: Customer Needs, Functional Requirements or Design Specifications?

- Light
- Fits onto Airplane table, with space for my diet Pepsi
- Easy to carry
- At least 2 GHz
- Enough space for all of my software
- No cheap plastic housings
- 8X DVD+/-R/RW drive
- No sweat or tears operation
- Intel Core i3

- Bright Screen
- At least 1366 x768 resolution
- Fast
- 6 cell Lithium-Ion battery
- An easy to use mouse
- Minimum 500 Gigabytes Hard disk space
- Free game software
- As small as possible
- Doesn’t run out of juice
Mixed messages

Laptop wish-lists: Customer Needs, Functional Requirements or Design Specifications?

- Light
- Fits onto Airplane table, with space for my diet Pepsi
- Easy to carry
- At least 2 GHz
- Enough space for all of my software
- No cheap plastic housings
- 8X DVD+/-R/RW drive
- No sweat or tears operation
- Intel Core i3

- Bright Screen
- At least 1366 x768 resolution
- Fast
- 6 cell Lithium-Ion battery
- An easy to use mouse
- Minimum 500 Gigabytes Hard disk space
- Free game software
- As small as possible
- Doesn’t run out of juice
Mixed messages

Laptop wish-lists: Customer Needs, Functional Requirements or Design Specifications?

- Light
- Fits onto Airplane table, with space for my diet Pepsi
- Easy to carry
- At least 2 GHz
- Enough space for all of my software
- No cheap plastic housings
- 8X DVD+/-R/RW drive
- No sweat or tears operation
- Intel Core i3

- Bright Screen
- At least 1366 x768 resolution
- Fast
- 6 cell Lithium-Ion battery
- An easy to use mouse
- Minimum 500 Gigabytes Hard disk space
- Free game software
- As small as possible
- Doesn’t run out of juice
Mixed messages

Laptop wish-lists: Customer Needs, Functional Requirements or Design Specifications?

- Light
- Fits onto Airplane table, with space for my diet Pepsi
- Easy to carry
- At least 2 GHz
- Enough space for all of my software
- No cheap plastic housings
- 8X DVD+/-R/RW drive
- No sweat or tears operation
- Intel Core i3

- Bright Screen
- At least 1366 x768 resolution
- Fast
- 6 cell Lithium-Ion battery
- An easy to use mouse
- Minimum 500 Gigabytes Hard disk space
- Free game software
- As small as possible
- Doesn’t run out of juice
Needs or Requirements

• It’s our job to sort that out

• Affinity Diagrams or CTQC trees are helpful tools
VOC Affinity Diagram
Break for Questions (… and snacks)
### Entering Customer Needs

<table>
<thead>
<tr>
<th>WHATs - Customer Needs</th>
<th>HOWs - Product Features</th>
<th>Importance: 5 High, 1 Low</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Needs** – Something a Customer would say they wanted – you could hear this coming from a customer’s mouth – but not measureable or specific
Entering Customer Needs

Relative Importance of Needs – we usually use a scale of 1-5 or 1-10. (You may need to understand which customers matter most before you do this)

Don’t forget the importance rating
### Requirements

<table>
<thead>
<tr>
<th>WHATs - Customer Needs</th>
<th>HOWs - Product Features</th>
<th>Importance: High</th>
<th>Low</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Feature Raw Score</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature Rank</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Target
What is a Customer Requirement?

- Something that measures whether the customer need is met
- Not a solution, but may point the way to solutions
- Should not be design / implementation specific
- What measures might the customer use to determine whether the need is met?

*Sometimes we get many of these in our VOC*
Developing the List

Use tools to group like needs together & identify high level requirements

• Affinity diagram

• Tree diagram

• Brainstorm (this is the creative part)

- Make sure requirements are clearly stated
- Try to keep requirements to five words or less
“Customer requirements” means customer needs translated into quantified characteristics – CTQs or CTSs

Customer Need + Measure + Target

Business Goal

Functional Requirement (Product/Process/Service Characteristic)

Cycle Time

Measure

Target/Nominal Value

Specification/Tolerance Limit(s)

From Request to Response

5 Days

+/− 3 Days

Fast Service

5σ or better performance

Customer Need + Measure + Target
Requirements – Something measurable – you can tell how you are doing in comparison – but generic – doesn’t imply a solution
# Similar to C&E but Not Quite

## WHATs - Customer Needs

<table>
<thead>
<tr>
<th>Feature</th>
<th>Raw Score</th>
<th>Feature Rank</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

## HOWs - Product Features

<table>
<thead>
<tr>
<th>Importance: 5 High, 1 Low</th>
</tr>
</thead>
</table>

MoreSteam.com®
Relationship Score

• Scoring is like the C&E Matrix
  • 1, 3 and 9

• The criteria for each score:
  • Blank = No relationship
  • 1 = The customer requirement only remotely affects the customer need
  • 3 = The customer requirement has a moderate effect on the customer need
  • 9 = The customer requirement has a direct and strong effect on the customer need
### Requirements Rating

Rate the customer requirements by multiplying the customer need rating with the relationship score and summing by customer requirement.

<table>
<thead>
<tr>
<th>Customer Need</th>
<th>Timely Communication</th>
<th>Communication to all affected parties</th>
<th>Complete Information Communicated</th>
<th>Management Support</th>
<th>Employee Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open Communication</td>
<td>8</td>
<td>3</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Buy-in</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Valid Selection Process</td>
<td>10</td>
<td>1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Sustainable Results</td>
<td>4</td>
<td>1</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92</strong></td>
<td><strong>252</strong></td>
<td><strong>252</strong></td>
<td><strong>192</strong></td>
<td><strong>144</strong></td>
</tr>
</tbody>
</table>
QFD Results – Requirement Weights

Pareto Chart showing Importance of Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
<th>Percent</th>
<th>Cum %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audit of systems (dates, classifications, people) with consistency</td>
<td>443.8</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>accuracy</td>
<td>431.5</td>
<td>19.4</td>
<td>39.4</td>
</tr>
<tr>
<td>ATIL Accuracy percentage prior to posting (FY)</td>
<td>254.8</td>
<td>11.5</td>
<td>50.9</td>
</tr>
<tr>
<td>percent of requests made to HP by resource</td>
<td>221.9</td>
<td>10.0</td>
<td>60.9</td>
</tr>
<tr>
<td>percent complete Opcom visibility requirements</td>
<td>193.2</td>
<td>8.7</td>
<td>69.6</td>
</tr>
<tr>
<td>percent of contingent labor meeting time bound requirements</td>
<td>134.2</td>
<td>6.0</td>
<td>75.7</td>
</tr>
<tr>
<td>percent of available resources on time bound requirements</td>
<td>123.3</td>
<td>5.6</td>
<td>81.2</td>
</tr>
<tr>
<td>percent of contingent labor meeting time bound requirements</td>
<td>119.2</td>
<td>5.4</td>
<td>86.6</td>
</tr>
<tr>
<td>percent complete Opcom visibility requirements</td>
<td>86.3</td>
<td>3.9</td>
<td>90.5</td>
</tr>
<tr>
<td>percent of approvals in place before requests made to HR for resource</td>
<td>75.3</td>
<td>3.4</td>
<td>93.9</td>
</tr>
<tr>
<td>percent of contingent labor meeting time bound requirements</td>
<td>74.0</td>
<td>3.3</td>
<td>97.2</td>
</tr>
<tr>
<td>percent of approvals in place before requests made to HR for resource</td>
<td>61.6</td>
<td>2.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

New Process Goals
One Last Step

- “Customer requirements” means customer needs translated into quantified characteristics – CTQs or CTSs

Fast Service

Business Goal
5σ or better performance

Customer Need + Measure + Target

Cycle Time

Functional Requirement (Product/Process/Service Characteristic)

Measure
Target/Nominal Value
Specification/Tolerance Limit(s)

From Request to Response
5 Days
+/- 3 Days
Now we have translated our “Customer Voices” into something we can measure how well our new processes will meet the needs of our customers.
1. Completeness of information

2. Accurate margin projections

3. Increase amount of value added time

<table>
<thead>
<tr>
<th>WHATs - Customer Needs</th>
<th>HOWs - Product Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Process Time</td>
<td>Cycle Time Request to Response</td>
</tr>
<tr>
<td></td>
<td>Value Added Time</td>
</tr>
<tr>
<td></td>
<td>Redundancy</td>
</tr>
<tr>
<td></td>
<td>Accurate Margin</td>
</tr>
<tr>
<td></td>
<td>Compliant to Internal and S</td>
</tr>
<tr>
<td></td>
<td>Complete Information</td>
</tr>
<tr>
<td></td>
<td>Appropriate Approval</td>
</tr>
<tr>
<td>Efficient</td>
<td></td>
</tr>
<tr>
<td>Best Margins</td>
<td></td>
</tr>
<tr>
<td>Meets Compliance</td>
<td></td>
</tr>
<tr>
<td>Aligns with Business</td>
<td></td>
</tr>
</tbody>
</table>

| Feature Raw Score      | 60 | 75 | 67 | 82 | 55 | 147 | 63 | 0  | 0  | 0  | 0  | 0  |
| Feature Rank           | 6  | 3  | 4  | 2  | 7  | 1   | 5  | 8  | 8  | 8  | 8  | 8  |

Target

Importance: 5 High, 1 Low
# Best Practice Sharing

<table>
<thead>
<tr>
<th>Customer Need</th>
<th>Priority Ranking</th>
<th>Timely Communication</th>
<th>Communication to all affected parties</th>
<th>Complete Information Communicated</th>
<th>Management Support</th>
<th>Employee Involvement</th>
<th>Benefits easy to understand</th>
<th>Visibility of benefits</th>
<th>Data Supported Selection</th>
<th>Involvement from PDC's on Selection</th>
<th>Data Supporting Improvement of metrics</th>
<th>Feed Back on Practice Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Open Communication</td>
<td>8</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>9</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2 Buy-in</td>
<td>6</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>1</td>
<td>9</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Valid Selection Process</td>
<td>10</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5 Sustainable Results</td>
<td>4</td>
<td>1</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>92</strong></td>
<td><strong>252</strong></td>
<td><strong>252</strong></td>
<td><strong>192</strong></td>
<td><strong>144</strong></td>
<td><strong>144</strong></td>
<td><strong>180</strong></td>
<td><strong>108</strong></td>
<td><strong>168</strong></td>
<td><strong>108</strong></td>
<td><strong>56</strong></td>
<td></td>
</tr>
</tbody>
</table>

[Source: MoreSteam.com®]
QFD (Quality Function Deployment) is a very powerful tool to translate the customer voice into something measurable.

We can use a simplified version in smaller process design projects.

The result is a good translation of customer needs that teams can do easily and much more quickly.
Thank You for Joining Us
Master Black Belt Program

• Offered in partnership with Fisher College of Business at The Ohio State University

• Employs a Blended Learning model with world-class instruction delivered in both the classroom and online

• Covers the MBB Body of Knowledge, topics ranging from advanced DOE to Leading Change to Finance for MBBs
Resource Links and Contacts

Questions? Comments? We’d love to hear from you.

Sheryl Vogt, President – Vogt Consulting
sheryl.vogt@vogtconsultinginc.com

Larry Goldman, Vice President Marketing – MoreSteam.com
lgoldman@moresteam.com

Watch for upcoming programs throughout the year!

Archived presentations and other materials:
http://www.moresteam.com/presentations/