

- Design Specifications (Sec. 6.3.1 through Sec. 6.3.3)
- House of Quality (Sec. 6.3.4)

			Hows vs. Hows	8			
	Who (Stakeholders)	1	Hows (Measures, Metrics)	6	Now	4	
Whats (Objectives, functions)	2	Who vs. Whats	3	What vs. Hows	7	Now vs. What	5
		How Muches (Targets)	9	Hows vs. How Muches	9		

- ## Quality Function Deployment (QFD)

- **Historical Background**
 - Initiated by Dr. Mizuno, Tokyo Institute of Technology
 - First application at Kobe Shipyard, 1972
 - Implemented by Toyota for a mini-van production, 1976
 - First introduction to North America in 1984, by Xerox
 - The standard practice of most leading organizations who in turn require it of their suppliers
- **Benefits of QFD**
 - Reduce product development time. For example, in 1980s-90s, it would take 5 years for North American automakers to put a product on the market, but the Japanese counterparts took 2.5 to 3 years to do the same.
 - When implemented correctly, it improves engineering knowledge, productivity and quality. It reduces costs, product development time, and engineering changes.
- **Features of QFD?**
 - It is a disciplined approach to product design, engineering, and production.
 - It provides in-depth evaluation of a product.
 - It is a tool used to fulfill customer expectations.
 - Customer driven as reflected by a set of specific (i.e., not abstract and generic) customer requirements.
 - Reduce implementation time due to fewer engineering changes.

- Features of QFD (cont'd)
 - Promoting teamwork within an organization from marketing to engineering to production to sales (a.k.a. horizontal sharing of information)
 - Providing documentation because tools for QFD serve as data base for future design and improvement, and as training tools for new engineers.
 - Flexible when new information is introduced or things have to be changed.
- What does HoQ do:
 - It captures the features of QFD in a single diagram
 - It translates the voice of the customer into design requirements (objectives, functions, constraints) that meet specific target values;
 - It matches the voice of the customer against how an organization will meet those requirements.
 - It is the primary planning tool for many managers and engineers when they plan for quality.
 - The HoQ is a “house” of many rooms plus a roof, each containing valuable information. Fig. 6.6 shows a “layout” of the house.
 - We focus on the “revised layout” with room numbering.
 - Room numbering also indicated the steps taken to complete construction of the house.
 - Information in each room and roof, and the main task involved:

1. Who (Stakeholders): Customers

Identify who they are

2. Whats: Customer requirements

Determine what the customers want

3. Who vs. Whats: Importance of customer requirements

Determine the ranking or weighting for each requirement

These 3 rooms together are to record the “voice of the customer” (Room 1-3)

4. Now: Competitors

Identify competitions

5. Now vs. Whats: How well do competitors do?

Evaluate competitors against customer requirements to find out how satisfied the customers are now

6. Hows: Engineering characteristics
Determine how customer requirements will be met
7. Whats vs. Hows: Correlation between customer requirements and engineering characteristics
Use the Hows to measure the Whats
8. Hows vs. Hows: Interactions between engineering characteristics
Determine if the Hows are dependent on each other

These three rooms together are to record the “voice of the organization/company” (Room 6-8)

9. How Muches, and Hows vs. How Muches: Engineering targets/specifications
Set targets (How Muches) for engineering characteristics, and measure competitions against targets

Room 1 – Who are the Customers?

There are a few classes of customers. They include, for example

- The end users or consumers
- Production customers
- Marketing/sales customers
- Service customers
- The regulators (government and technical)

Room 2 – What do customers want?

For end users or consumers

A product that:

- Works as it should (this is *Performance*)
- Lasts a long time (this is *Durability*)
- Is easy to maintain
- Looks attractive
- Has many features, and
- Incorporates the latest technology

For production customers

A product that:

- Is easy to produce (both manufacture and assemble)
- Uses available resources (human, equipment, materials)
- Uses standard parts and methods
- Uses existing facilities
- Produces minimum waste/scrap

For marketing/sales customers

A product that

- Meets consumers' requirements
- Is easy to package, store and transport
- Is attractive
- Displays well on shelves

How to find out what customers want?

- Observations
- Surveys
- Focus groups

Room 3 – Relative Importance of Customer Requirements

Steps

- Objective trees (one for each class of customer)
- PCC for ranked requirements; or
- Weighted objective tree for weighted requirements

Rooms 1 through 3 – Voice of the customer

Example:

A company wants to expand its product lines by producing water guard (Splashguard). This product will primarily be used by the so-called dual-use riders who ride off-road and for commute.

Ranked importance:

- PCC
- Scale 1-some integer (say 10)
- 1 being most important or being least important – no consistent rules

Weighted Importance:

- Similar to weighted objective tree

Ranked Importance:

		End Users	Marketing	Service	Score * Decimal Weight	Weight (%)
Functional performance	Keeps water off rider	3	8	8	#	17%
	Fast to attach	2	5	6	#	11%
	Fast to detach	1	4	3	#	7%
Interface with bike	Good fit	7	6	7	#	19%
	Nor marring	4	3	4	#	10%
	Color matching	5	1	2	#	8%
Light weight		6	2	5	#	12%
Low cost		8	7	1	#	16%
		0.4	0.3	0.3	36	100

Ranking from 1 (least important) to 8 (most important)

		Weight (%)
Functional performance	Keeps water off rider	11
	Fast to attach	12
	Fast to detach	7
Interface with bike	Good fit	20
	Nor marring	11
	Color matching	9
Light weight		13
Low cost		17

Room 4 – Who are the competitors?

Room 5 – How satisfied are the customers now?

Two purposes:

- Awareness of what already exists
- Identifying opportunities to improve on what already exists

How to evaluate competitors against customer's requirements (known as competition benchmarking)?

- Subjective evaluation based on customer's opinions (objective evaluation in Room 9)
- Scale of 1 to 5:
 1. Does not meet the requirement at all
 2. Meets the requirement slightly
 3. Meets the requirement somewhat

- | | | Weight (%) | Room 6 | Product A | Product B | Product C |
|------------------------|-----------------------|------------|--------|-----------|-----------|-----------|
| Functional performance | Keeps water off rider | | Room 7 | 1 | 4 | 2 |
| | Fast to attach | | | 1 | 4 | 2 |
| | Fast to detach | | | 2 | 4 | 3 |
| Interface with bike | Good fit | | | 3 | 2 | 4 |
| | Nor marring | | | 3 | 1 | 4 |
| | Color matching | | | 3 | 2 | 2 |
| Light weight | | | | 3 | 3 | 4 |
| Low cost | | | | 2 | 3 | 1 |

The goal is to develop a set of engineering characteristics that cast the design problem in terms of measures/metrics that have target values.

- Each cell represents how an engineering characteristic relates to a specific customer's requirement
- Such relationship can be strong, moderate, weak or no relationship at all.

3: medium/moderate relationship

Blank: no/little relationship

[illegible]

Reading Assignments:

S 6.3.4