

CAD/CAM

(21-342)

*Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology*

Session #9



Course Description

- *Instructor*
 - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
 - *Email: FValilai@sharif.edu, Tel: 6616-5706*
 - *Website: Sharif.edu/~fvalilai*
- *Recommended prerequisite*
 - *Manufacturing process I (21-418)*
- *Class time*
 - *Sunday-Tuesday 18:00-19:30*
- *Course evaluation*
 - *Mid-term (25%)*
 - *Final exam (40%)*
 - *Quiz (5%)*
 - *Exercise (Manufacturing Lab.) (30%)*

Course Description (Continued ...)

- **Mid-term session:**
 - Wednesday: 9th Ordibehesht 1394, 16:30 ~ 18:30
- **Final Exam:**
 - Monday: 1st Tir 1394, 09:00 ~ 11:30
- **Reference:**
 - John Priest, Jose Sanchez; "Product Development and Design for Manufacturing: A Collaborative Approach to Producibility and Reliability, Second Edition", CRC Press, 2001
 - Mital et al. , "Product Development A Structured Approach to Consumer Product Development, Design, and Manufacture", Butterworth-Heinemann, 2008
 - Benhabib, Beno; "Manufacturing: Design, Production, Automation, and Integration", 2003, Marcel Dekker Inc, New York
 - Abouel Nasr, Emad; Kamrani, Ali K.; "Computer-Based Design and Manufacturing: An Information-Based Approach", 2007, Springer, New York

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The Design Needs and Specifications

- **Early Design:**
 - **Customer Needs Analysis**
Defining the customer's needs can be an extremely complex process resulting in many different and conflicting types of information.

There are several approaches for knowledge acquisition of customer needs.

The design team should use several of these methods to insure that the final requirements are representative of the customer.

The Design Needs and Specifications

- *Early Design:*
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - *Interviews of customers including techniques such as surveys*
 - *Design partnerships or alliances*
 - *Computer databases and data mining*
 - *Consultants or experts*
 - *Brainstorming sessions*
 - *Personal and company experience*
 - *Published information such as magazines, patents, etc.*
 - *Technology capability forecasting*
 - *Market and competitor benchmark analysis*
 - *Prototyping and virtual reality*
 - *House of quality or Quality Function Deployment*

The Design Needs and Specifications

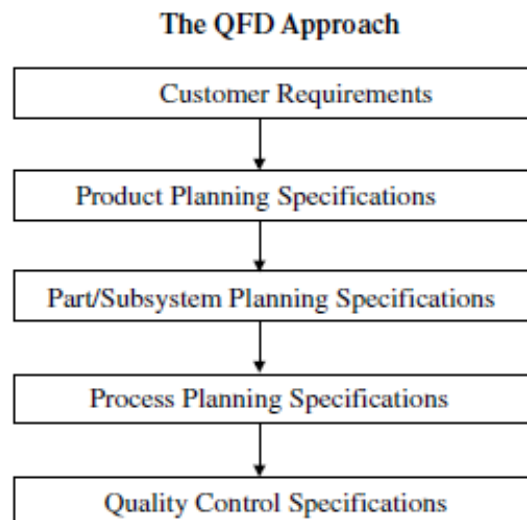
- *Early Design:*
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - *QFD*
 - *QFD constitutes “A system for translating customer requirements into appropriate company requirements at every stage, from research through production design and development, to manufacture, distribution, installation and marketing, sales and services”*

The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**
 - *The QFD process begins when we endeavor to pinpoint customer requirements (or needs), which are usually expressed in terms of qualitative characteristics.*
 - *During the process of product development, customer requirements are successively converted into internal company requisites, called design specifications*

The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**



The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**
 - *To effectively obtain the required quality characteristics, the identified manufacturing process specifications are translated into quality control specifications.*
 - *Such specifications include like:*
 - *Inspection plans for acquired materials,*
 - *Information needed to determine which activities will need monitoring with statistical process control (SPC),*
 - *Planned preventive maintenance on machinery*
 - *Instructing and training operative personnel.*

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The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**

QFD PLANNING STRUCTURE

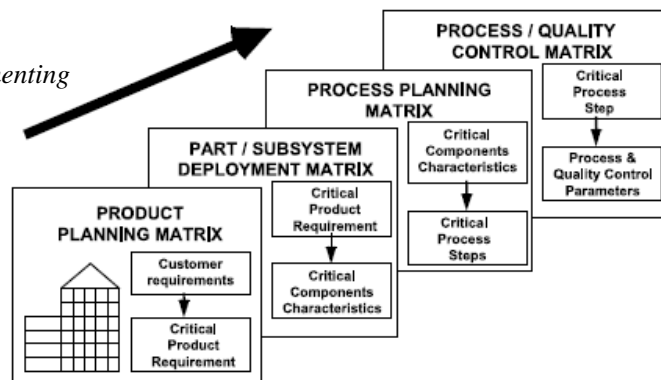


FIGURE 3.4 The logical sequence of QFD forms. The first two modules (house of quality and part characteristics) refer to product planning; the second two refer to manufacturing process planning and quality control. (From Crow, K.A. [1992], Seminar on Concurrent Engineering, DRM Associates, Rome.)

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The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**
 - *The first matrix to be used in QFD is known as the house of quality (HoQ).*
 - *This matrix serves to describe the basic process underlying QFD: the transition (based on a strategy of input–output) from a list of customer requirements, the “what,” through to a list of considerations as to “how” the requirements will be met (product characteristics).*

The Design Needs and Specifications

- **Early Design:**
 - *Customer Needs Analysis*
 - *Methods for capturing and documenting customer needs:*
 - **QFD**

		Design "HOWs"								
		Temperature at which it is served	Caffeine content	Flavor components	Flavor intensity	Aroma components	Aroma intensity	Sales price	Volume	Coffee temperature after a given time lapse
Customer "WANTS"	Warm	RELATIONSHIP MATRIX ("WHATs" vs "HOWs")								
	Keeps awake									
	Good flavor									
	Good aroma									
	Low price									
	Adequate quantity									
	Warm after a given time lapse									

The Design Needs and Specifications

- **Early Design:**
 - Customer Needs Analysis
 - Methods for capturing and a customer needs:
 - QFD

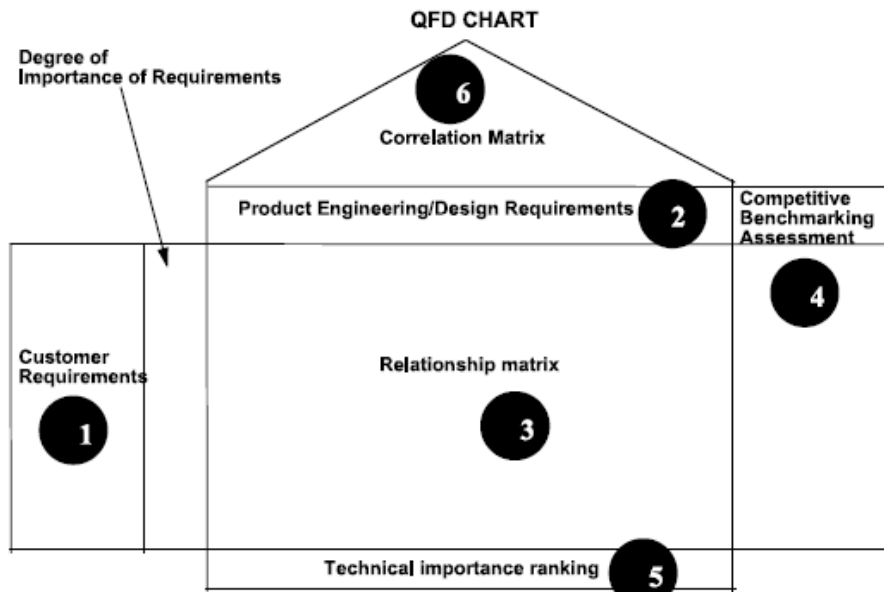
Customer "WHATs"	Design "HOWs"								
	Temperature at which it is served	Caffeine content	Flavor components	Flavor	Aroma components	Aroma intensity	Sales price	Volume	Coffee temperature after a given time lapse
Warm	○								
Keeps awake	○	○							
Good flavor	△	△	○	○					
Good aroma					○	○			
Low price							○	○	
Adequate quantity							○	○	
Warm after a given time lapse	○								○

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The Design

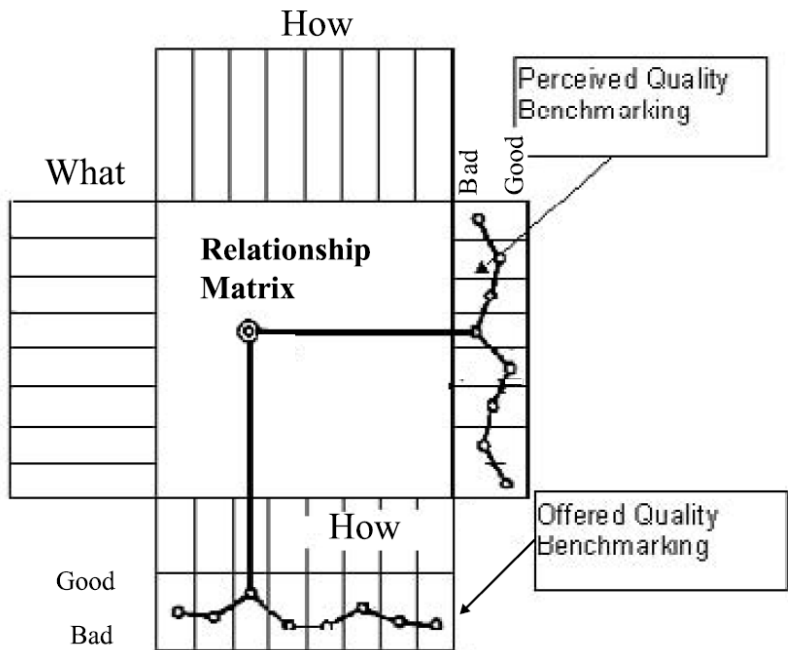
- **Early Design:**
 - Customer Requirements
 - Methods for capturing and a customer requirements:
 - QFD



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The Design Needs are

- Early Design:
 - Customer Needs Analysis
 - Methods for capturing customer needs:
 - QFD



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The Design Needs and Sp

- Early Design:
 - Customer Needs Analysis
 - Methods for capturing and customer needs:
 - QFD

Customer Requirements		Customer priority	Mean time between failure = 5000 hours	Accuracy = 0.0001	Built-in self-test	Computer controlled	Mean time to repair = 0.5 hours	Self-calibration	Module level replacement	Competitive Benchmarking			
										1	2	3	4
High degree of compatibility		△				○			△	A	B	C	○
Ease of operation		○			⊙	⊙	△	○	△	C	B	○	A
Capable of close tolerance		⊙		⊙					○	B	C	○	A
Minimum operating costs		○	○		○		△	△	△	○	B	C	A
Highly reliable		⊙	⊙		○	△		△		C	B	○	A
Risk		⊙	○	△	△	○	○	△					
Weights	Absolute		12	9	15	14	2	8	3				
	Relative		108	27	15	14	6	24	3				
Key elements			X	X				X					
Technical Benchmarking	Our company:	○ 4	B	○	○	B	C	○	C				
	Competitor: A	3	○	B	B	A	B	A	B				
	Competitor: B	2	C	A	A	C	A	A	B				
	Competitor: C	1	A	C	C	C	○	C	○				

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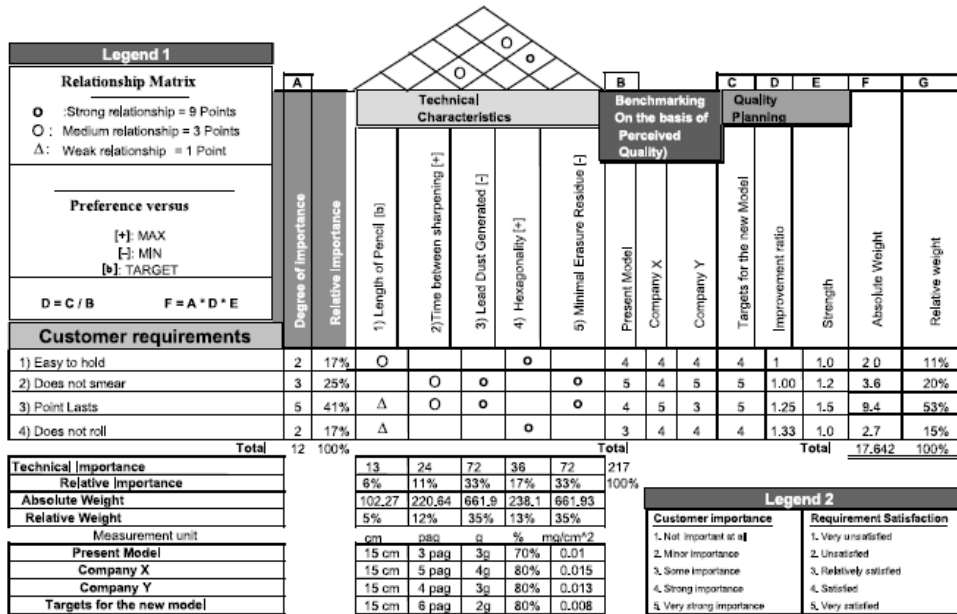


FIGURE 4.10 The house of quality for the planning of a pencil. (From Wasserman, G.S. [1993], *IIE Trans.*, 25(3), 59-65. With permission.)