

Collaborative Engineering

Product Definition: QFD



- Quality Function Deployment
- House of Quality
- Building House of Quality
- Summary

OrthoCAD Lab, I.I.T. Bombay

Quality Function Deployment

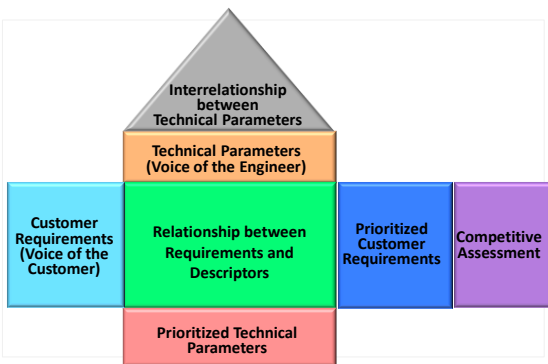
- Method to transform user demands into design quality
- To deploy the functions forming quality
- To deploy methods for achieving design quality into product

History:

- Inventor; prof. Akao, Japan (1966)
- First implementation: Mitsubishi, (1972)
- First book published (1978)
- First English article (1983)
- TRIZ, Taguchi, Kaizen, House of quality



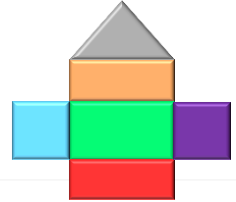
House of Quality



Building House Of Quality

- List Functional Requirements (What's)
- List Technical Parameters (How's)
- Develop Relationship (What's vs How's)
- Develop Interrelationship (How's vs How's)
- Prioritize Customer Requirements
- Prioritize Technical Descriptors

Example: A Writing Device



Customer's Requirement (What's)

		"Voice of the Customer"			
		Smooth	Easy Refill	No Smudge	Good Grip
Customer Requirements	Smooth				
	Easy Refill				
	No Smudge				
	Good Grip				
	Corp. Look				
		Requirements: products and service			

Technical Parameters (How's)

		"Voice of the Engineer"				
		Shape	Body	Ink	point	Refill
Customer Requirements	Smooth					
	Easy Refill					
	No Smudge					
	Good Grip					
	Corp. Look					
		Mistakes magnify later				
		Can be measured				

Relationship Matrix (How's vs What's)

		Tech. Parameter				
		Shape	Body	Ink	point	Refill
Customer Requirements	Smooth	★	★	★	★	
	Easy Refill			△	★	
	No Smudge		•	★		
	Good Grip	•	★			
	Corp. Look	★	★			

▪ Relationship between
 > Customer needs and
 > Technical ability

Customer Competitive Assessment

		Tech. Parameter					Customer Survey			
		Shape	Body	Ink	point	Refill	5	2	4	3
Customer Requirements	Smooth	★	★	★	★					
	Easy Refill			△	★					
	No Smudge		•	★						
	Good Grip	•	★							
	Corp. Look	★	★							

My Pen
Pencil
Ball Pen
Ink Pen

Customer Competitive Assessment

Customer Competitive Assessment

		Tech. Parameter					Customer rate to competition			
		Shape	Body	Ink	point	Refill	5	2	4	3
Customer Requirements	Smooth	★	★	★	★		5	2	4	3
	Easy Refill			△	★		5	1	5	1
	No Smudge		•	★			4	2	4	3
	Good Grip	•	★				2	3	3	2
	Corp. Look	★	★				3	1	2	4

My Pen
Pencil
Ball Pen
Ink Pen

Customer Competitive Assessment

▪ Customer rate to competition
 ▪ Benchmarking

Technical Competitive Assessment

		Tech. Parameter					Technical Comparison			
		Shape	Body	Ink	point	Refill	5	2	4	3
Customer Requirements	Smooth	★	★	★	★		5	2	4	3
	Easy Refill			△	★		5	1	5	1
	No Smudge		•	★			4	2	4	3
	Good Grip	•	★				2	3	3	2
	Corp. Look	★	★				3	1	2	4

My Pen
Pencil
Ball Pen
Ink Pen

Customer Competitive Assessment

▪ Technical Comparison
 ▪ Reverse engineering

Technical Competitive Assessment

		Tech. Parameter					Technical Comparison			
		Shape	Body	Ink	point	Refill	5	2	4	3
Customer Requirements	Smooth	★	★	★	★		5	2	4	3
	Easy Refill			△	★		5	1	5	1
	No Smudge		•	★			4	2	4	3
	Good Grip	•	★				2	3	3	2
	Corp. Look	★	★				3	1	2	4

My Pen
Pencil
Ball Pen
Ink Pen

Customer Competitive Assessment

▪ Technical Comparison
 ▪ Reverse engineering

Prioritize Customer Requirements

		Tech. Parameter					Improvements			
		Shape	Body	Ink	point	Refill	5	2	4	3
Customer Requirements	Smooth	★	★	★	★		5	2	4	3
	Easy Refill			△	★		5	1	5	1
	No Smudge		•	★			4	2	4	3
	Good Grip	•	★				2	3	3	2
	Corp. Look	★	★				3	1	2	4

My Pen
Pencil
Ball Pen
Ink Pen

Customer Competitive Assessment

Scale-Up Factor
Target point

Prioritize Customer Requirements

▪ Unique selling point

		Tech. Parameter												
		Shape	Body	Ink	Point	Refill								
Customer Requirements	Smooth			★	★		5	2	4	3		1	1.6	5
	Easy Refill			△		★	5	1	5	1		1	1.6	5
	No Smudge			●	★		4	2	4	3		1	1	4
	Good Grip	●	★				2	3	3	2		2	1	4
	Corp. Look	★	★				3	1	2	4		1.6	1.5	5
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Scale-Up Factor	Sales Point	Target point
	Pencil	1	1	1	2	4								
	Ball Pen	2	2	3	3	3								
	Ink Pen	5	5	5	4	1								

Prioritize Customer Requirements

▪ More importance: looks and grip

		Tech. Parameter													
		Shape	Body	Ink	Point	Refill									
Customer Requirements	Smooth			★	★		5	2	4	3		4	1	1.6	5
	Easy Refill			△		★	5	1	5	1		4	1	1.6	5
	No Smudge			●	★		4	2	4	3		3	1	1	4
	Good Grip	●	★				2	3	3	2		3	2	1	4
	Corp. Look	★	★				3	1	2	4		5	1.6	1.5	5
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Scale-Up Factor	Sales Point	Target point	
	Pencil	1	1	1	2	4									
	Ball Pen	2	2	3	3	3									
	Ink Pen	5	5	5	4	1									

Prioritize Customer Requirements

▪ More importance: looks and grip

CI x SF x SP = AW

		Tech. Parameter														
		Shape	Mat.	Ink	Case	Refill										
Customer Requirements	Smooth			★	★		5	2	4	3		4	1	1.6	5	6
	Easy Refill			△		★	5	1	5	1		4	1	1.6	5	6
	No Smudge			●	★		4	2	4	3		3	1	1	4	3
	Good Grip	●	★				2	3	3	2		3	2	1	4	6
	Corp. Look	★	★				3	1	2	4		5	1.6	1.5	5	12
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Scale-Up Factor	Sales Point	Target point	Absolute Weight	
	Pencil	1	1	1	2	4										
	Ball Pen	2	2	3	3	3										
	Ink Pen	5	5	5	4	1										

Prioritize Technical Requirements

▪ Improvement: Material

		Tech. Parameter														
		Shape	Body	Ink	Point	Refill										
Customer Requirements	Smooth			★	★		5	2	4	3		4	1	1.6	5	6
	Easy Refill			△		★	5	1	5	1		4	1	1.6	5	6
	No Smudge			●	★		4	2	4	3		3	1	1	4	3
	Good Grip	●	★				2	3	3	2		3	2	1	4	6
	Corp. Look	★	★				3	1	2	4		5	1.6	1.5	5	12
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Scale-Up Factor	Sales Point	Target point	Absolute Weight	
	Pencil	1	1	1	2	4										
	Ball Pen	2	2	3	3	3										
	Ink Pen	5	5	5	4	1										
Abs. Weight (5 scale)						3	5	4	4	3						

Prioritize Technical Requirements

▪ Organizational difficulty

		Tech. Parameter														
		Shape	Body	Ink	Point	Refill										
Customer Requirements	Smooth			★	★		5	2	4	3		4	1	1.6	5	6
	Easy Refill			△		★	5	1	5	1		4	1	1.6	5	6
	No Smudge			●	★		4	2	4	3		3	1	1	4	3
	Good Grip	●	★				2	3	3	2		3	2	1	4	6
	Corp. Look	★	★				3	1	2	4		5	1.6	1.5	5	12
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Target point	Scale-Up Factor	Sales Point	Absolute Weight	
	Pencil	1	1	1	2	4										
	Ball Pen	2	2	3	3	3										
	Ink Pen	5	5	5	4	1										
Abs. Weight (5 scale)						3	5	4	4	3						
Tech. Difficulty						3	3	5	3	4						
Target						3	5	4	3	3						

Correlation Matrix (How's vs How's)

+9 □ Strong +ve
 +3 ○ Positive
 -3 ☆ Negative
 -9 △ Strong -ve

▪ Conflicting technical descriptors
 ▪ Strong negative conflicts should be resolved

		Tech. Parameter														
		Shape	Body	Ink	Point	Refill										
Customer Requirements	Smooth			★	★		5	2	4	3		4	1	1.6	5	6
	Easy Refill			△		★	5	1	5	1		4	1	1.6	5	6
	No Smudge			●	★		4	2	4	3		3	1	1	4	3
	Good Grip	●	★				2	3	3	2		3	2	1	4	6
	Corp. Look	★	★				3	1	2	4		5	1.6	1.5	5	12
Technical Competitive Assessment	My Pen	3	3	5	4	3	My Pen	Pencil	Ball Pen	Ink Pen	Customer Importance	Target point	Scale-Up Factor	Sales Point	Absolute Weight	
	Pencil	1	1	1	2	4										
	Ball Pen	2	2	3	3	3										
	Ink Pen	5	5	5	4	1										

SUMMARY

- Orderly Way Of Obtaining Information & Presenting It
- Shorter Product Development Cycle
- Considerably Reduced Start-Up Costs
- Fewer Engineering Changes
- Reduced Chance Of Oversights During Design Process
- Environment Of Teamwork
- Consensus Decisions
- Preserves Everything In Writing

