Mountain Ash Consulting Ltd

White Paper

CUSTOMER-DRIVEN PRODUCT DEVELOPMENT WITH QUALITY FUNCTION DEVELOPMENT

How to Design Succesful New Products

The success of new products in the market depends on how well they meet customer needs. Quality Function Deployment provides a structured methodology for translating the 'Voice of the Customer' into design requirements, guiding the product development process and improving the success rate for new products. This paper shows how QFD can improve your product development process by focussing on customer expectations, resulting in a real competitive edge for your new products.

There is no magic to QFD, just plenty of intelligent, thorough work."

Quality Function Deployment for Products, American Supplier Institute, 1997.

WHAT IS QFD?

Quality Function Deployment (QFD) was developed in Japan in the 1960s as a planning and quality assurance tool. Since the mid 1980s it has been used worldwide and has emerged as a very powerful model to assess the importance of customer wants and needs and to make sure they are addressed in the design process. The benefits are:

- increased customer satisfaction;
- reduced time to market;
- reduced costs for development and manufacture
- improved design reliability;
- information for competitive benchmarking;
- documentation of your product development process;
- clear direction for product improvement.

HOW QFD WORKS

1. Customer Requirements

As with other methodologies, QFD starts with a list of customer requirements – the Voice of the Customer. This list is likely to be vague, especially if the customer has never had experience of this product before, but a skillful co-ordinator should be able to create a set of critical customer needs, using techniques such as affinity diagrams, critical observation or function analysis and prioritise them. Comparison tests are used to rank these requirements and show their relative importance.

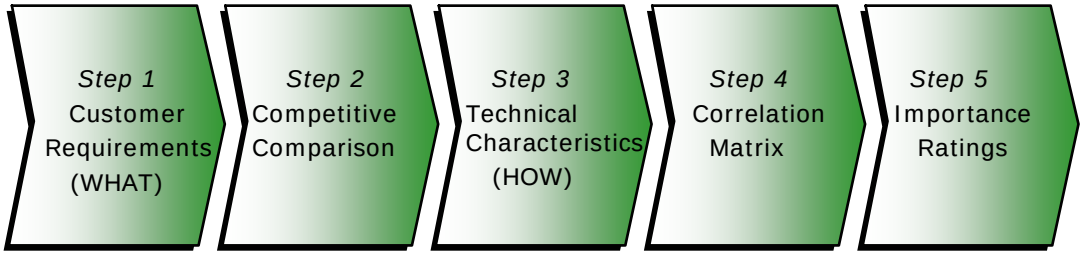


Figure 1 – QFD Approach

The *customer requirements* form the first section of the comprehensive matrix for documenting findings, which is commonly referred to as the process House of Quality (see Fig. 2).

"QFD is not an easy process. It takes leadership and determination on the part of many people to dedicate the time and energy needed.
But that effort pales in comparison to the effort expended in a poorly planned project."

Quality Function Deployment for Products, American Supplier Institute, 1997.

2. Competitive Comparison

It is often the case that marketing are the only ones with knowledge of the competition. Unless this information is transferred to the rest of the team, this can result in me-too products.

With QFD, the whole team perform a competitive analysis, comparing current and likely future strengths and weaknesses in order to identify threats and opportunities. At this stage it is important to understand the customer's perception of the competitive offering. It is also vital that both the technical and marketing personnel in the team are involved in order to gain a fuller understanding of the competitive scene.

The competitive comparison gives us another opportunity to ensure that all angles have been covered and that decisions are taken based on objective information. If anything is overlooked and not acted upon, it is possible that our new product achieve excellent in-house test results, yet fails to delight our customers.

3. Technical Characteristics

Having defined the *customer requirements (*WHATs) and looked at the competitor scene, the next step is to list one or more HOW for each WHAT. We are now translating *customer requirements* into the *technical characteristics*, listing the features of the design. The relationships between the WHATs and the HOWs are often complex with many intervening factors, which are difficult to take into account. The r*elationship* section of the House of Quality helps untangle this complex web of relationahips between the WHATs and the HOWs. Symbols are commonly used to depict the strength of the relationships.

This stage also give team the chance to ensure that technical charateristics are only developed in reponse to a real need from the customer. This reduces unnecessary costs and product complexity.

Another benefit of QFD is that technical characterstics are considered independent of a particular technical solution. This allows the team to consider multiple concept alternatives before selecting the optimal solution. The result is more likely to be a breakthrough technology, which changes the basis of competition, rather that the usual linear improvement from more traditional approaches.

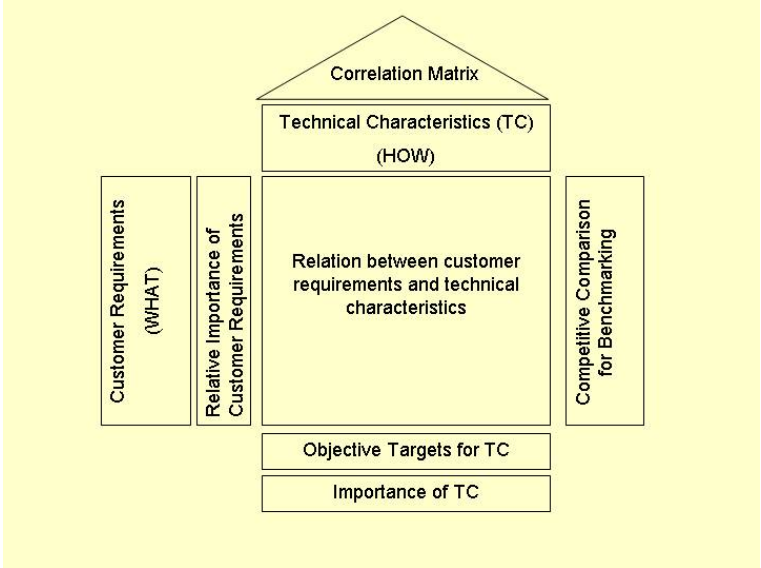


Figure 2 – House of Quality

The next element related to the *technical characteristics* is the *objective targets* section. This provides an objective means of assuring that the requirements have been met and also provide targets for further development.

4. Correlation Matrix

The *correlation matrix* is a triangular table, estabilishing the correlation between each HOW item. As in the *relationship matrix*, symbols are used to describe the strength of the various relationships and also to indicate whether these relationships are positive or negative.

This is a useful extension to the House of Quality and is to be used as required. It can be extremely helpful in identifying positive correlations, where the same result can be achieved by separate means and action can be taken to avoid duplication. It can also show negative correlations, which represent trade-offs. Early resolution of these trade-offs is essential to

avoid problems at a later stage. This often requires a degree of innovation. However, effort at this stage may lead to significant competitive advantage and save redesign at a later date.

5. Importance Ratings

The *importance ratings* are calculations based on the *customer requirements*, the *relative importance* of these requirements and the strength of the relationship as expressed in the *relationship matrix*. Therefore, a *technical characteristic* which had several strong correlations with several *customer requirements* would result in a high importance rating. This is a useful exercise for prioritising efforts and making trade-off decisions.

QFD takes the Voice of the Customer all the way through product development to the factory floor and out into the market place.

6. Analysis

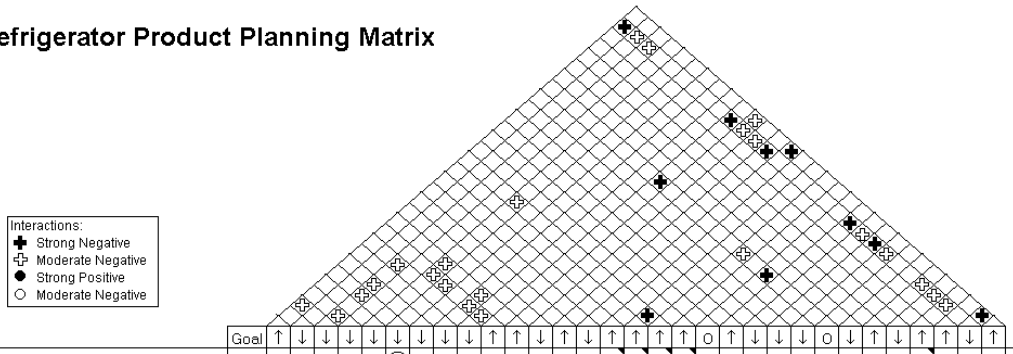
The House of Quality (see fig. 3) matrix provides the team with the information to finalise the product development strategy and determine the objectives and action plan. Once product planning is complete a more detailed specification is prepared. This information is fed into the next phase – design deployment – which in turn provides the inputs for process planning and then finally production planning.

QFD is a useful methodology to facilitate planning, decision-making and communication in the product development environment. At its core is the Voice of the Customer, which gives it the cohesive platform throughout the product development process. QFD takes the Voice of the Customer all the way through product development to the factory floor and out into the market place. If QFD is done thoroughly, your new products should delight the customer, outshine the competition and succeed!

ABOUT MOUNTAIN ASH CONSULTING LIMITED

Mountain Ash Consulting Limited works with small and medium sized companies to help them develop winning new products. We can offer assistance at any stage of the product development process, from concept, design and engineering, prototype testing through to launch. QFD is just one of the methodologies we use. For more information on how we can help your company go to www.ma-consult.co.uk or call +44 (0)1698 389 456.

Refrigerator Product Planning Matrix



	Customer Needs	Priority	Compressor energy efficiency rating	Insulation efficiency	Noise measurement-front	Refrig. temp. range (on/off cycle)	Refrig. temperature variation	Refrig. cooling speed (from 30°C to 5°C)	Freezer temp. range (on/off cycle)	Freezer temperature variation	Freezer cooling speed (30°C to -15°C)	Volume efficiency (total/usable)	% Shelf & tray area adjustable	Drawer/shelf pull force	# of visibility features	Dis-assy & re-assy time for cleaning	% of features rated easy to clean	Freezer width	Refrigerator shelf depth & width	Freezer shelf height	Door tray depth	Warranty period (years)	Water filter replacement time & cost	10 year service contract cost	Time to disassb & reassb door	Refrigerator depth	Stainless & trim panel option prices	Focus group rating - appearance	Water temperature	Water filter indicator & life	Ice produced daily	Manufacturing cost	No. of adjustable temp. drawers	Competitive Evaluation (1-Low, 5-High) 1 3 5	Sales Points	Improvement Goal	Improvement Factor	Relative Development Effort
	Goal		↑	↓	↓	↓	↓	↓	↓	↓	↓	↑	↑	↓	↑	↓	↑	↑	↑	↑	O	↑	↓	↓	↓	O	↓	↑	↓	↑	↑	↓	↑				
Operation	Low energy consumption	4	5	5																													U MGF A W	1.0	3	1.1	1
	Quiet	1			5																												MFA WG U	1.0	5	1.0	0
	Maintains temperature	3		1		3	3	3																									FA MWG U	1.0	5	1.0	0
	Preserves food & freshness	3		1		5	5	5	5	5	5																					5	MFA WG U	1.2	5	1.0	0
Storage	Maximize storage space	5		3								5						3	3	3													U MG FA W	1.1	5	1.4	5
	Flexibility for changing storage needs	3										3	5	1		3																3	A U WGF M	1.0	3	1.1	1
	Easy access & visibility	4											1	5	5	3		1	1	1													U FA WG M	1.0	3	1.2	1
	Easy to clean	2														5	5																MWGFA U	1.0	5	1.0	0
	Handles large containers & items	4										3	3					5	5	5	5												U WGA MF	1.0	3	1.2	1
Reliab	Reliable, doesn't break	5																				5											M WGA F U	1.0	5	1.0	0
	Easy & low cost to service	3																				5	5	5	1								U MA WG F	1.0	4	1.3	1
Kitchen	Easy to deliver & install	1																							5	3							MWGFA U	1.0	5	1.0	0
	Fits in kitchen space	5		3								5														5							UMF A WG	1.1	5	1.4	5
	Coordinates with kitchen décor	4																								3	5	5					U MFA WG	1.0	3	1.1	1
Disp.	Dispenses purified water	3				1																	3						5	5			UMFA W G	1.0	3	1.0	0
	Provides & dispenses purified ice	3							1														3						5	5	5		UMFA G W	1.0	3	1.0	0
$	Low price	3																														5	M UWG FA	1.2	5	1.2	5
Technical Evaluation (Italicized numbers represent subjective ratings)	U		5.3	160		30		2.0			110	53%		2				300		450x475		5/2		2		29				2kg	486	3 drw				
	M		5.5	150	34	34	4.0	3.0	228	6.0	121	56%	5	4	3	2	4	316	464x475	4	5	5/1	3	4	1	28	2	4	5	5	5kg	513	3 drw				
	W		5.5	150	34	2.0	2.0	235	4.0	2.0	121	55%	4	4	4	5	5	320	422x413	5	5	5/1	5	4	4	28	28	4	5	4	5	2.3kg	471	3 drw				
	G		5.5	150	34	3.0	2.0	230	5.0	3.0	121	58%	3	4	4	4	3	320	440x460	3	5	5/1	3	5	4	4	28	28	5	4	4	2.3kg	487	3 drw				
	F		5.5	150	34	3.0	3.0	230	5.0	3.0	121	55%	4	3	3	4	3	310	418x446	3	5	5/1	4	3	4	4	28	28	3	4	4	2.3kg	511	3 drw				
	A		5.5	150	34	3.0	3.0	230	5.0	3.0	121	56%	3	4	3	4	3	310	430x465	5	5	5/1	3	4	4	4	29	28	2	4	4	2.3kg	511	3 drw				
Target Value			5.8	150 Kcal/m²°C (equiv. to R-141b)	30 decibels	2°C	2°C	160 minutes	3°C	2°C	100 minutes	60%	x%	< 2 Kg	Equal to Whirlpool	X minutes	X%	320mm	450mm wide x 420mm deep	X mm	180 mm	5yr Compressor / 2yr Parts	<3 minutes & $15	< $99	< X minutes	24 inches	$60 Stainless & $40 Trim Pkg	70% rating	X°C	Yes / 6 months	2.5 kg/day	$502	4 drawers				
Technical Difficulty (1-Low, 5-High)			4	5	2	1	2	1	2	2	1	5	4	2	3	2	2	3	4	1	1	3	2	1	1	5	3	3	1	3	3	5	5				
Importance Rating			22	75	5	30	27	27	30	27	27	101	36	27	24	34	10	52	52	52	24	45	38	20	9	55	22	22	30	30	15	22	28				

U - Us
M - Maytag
W - Whirlpool
G - GE
F - Frigidaire
A - Amana

Figure 3 – Completed House of Quality Example

Source: iSixSigma