

VOICE OF THE CUSTOMER (DEFINE): QFD TO DEFINE VALUE

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SUMMARY

Capture, rank and deploy the Voice of the Customer and translate that voice into staff actions. Learn the principles and applications of Quality Function Deployment used by many leading organizations such as 3M, AT&T, Boeing, Chevron, DaimlerChrysler, EDS, Ford, General Motors, Gillette, Hewlett-Packard, Hughes, IBM, Jet Propulsion Laboratory, Kawasaki Heavy Industry, Kodak, Lockheed-Martin, Marriott, Motorola, NASA, NATO, NEC, Nissan Motors, Nokia, Pratt & Whitney, Proctor & Gamble, Raytheon, Sun Microsystems, Texas Instruments, Toshiba, U.S. Department of Defense, Visteon, Volvo, Xerox and many others.

INTRODUCTION

What is Quality Function Deployment? Basically, QFD is designed to improve customer satisfaction with the quality of our products and services. What can QFD do that is not already being done by traditional quality systems? To understand QFD, it is helpful to contrast the differences between modern and traditional quality systems.

TRADITIONAL QUALITY SYSTEMS

Traditional approaches to assuring quality often focus on work standards (Love 1986), automation to eliminate human error-prone processes, and in more enlightened organizations, Quality Improvement Teams to empower employees to resolve problems. As organizations are finding out, however, consistency and absence of problems are not enough of a competitive advantage after the market shakes out suboptimal players. For example, in the automobile industry, despite the celebrated narrowing of the "quality" (read that fit and finish) gap between U.S. and Japanese makers, Japanese cars still win the top honors in the J.D. Powers Survey of New Car Quality. Suboptimal makers have all but disappeared from the North American market, the fit and finish of today's North American built vehicles are better than ever, but still the Japanese makes of Toyota, Nissan, and Honda grab top honors.

MODERN QUALITY SYSTEMS

QFD differs from traditional quality systems which aim at minimizing negative quality (such as poor service, broken product). With traditional systems, the best you can get is *nothing wrong* - which is no longer good enough. In addition to eliminating negative quality, we must also maximize positive quality end-to-end throughout the organization. This creates **value** which leads to customer satisfaction.

Nothing Wrong \neq Anything Right

Quality Function Deployment is the only comprehensive quality system aimed specifically at satisfying the customer. It concentrates on maximizing customer satisfaction (positive quality) by seeking out both spoken and unspoken needs, translating these into actions and designs, and communicating these throughout the organization end-to-end (**Figure 1**). Further, QFD allows customers to prioritize their requirements, benchmark us against our competitors, and then direct us to optimize those aspects of our product, process, and organization that will bring the greatest competitive advantage.

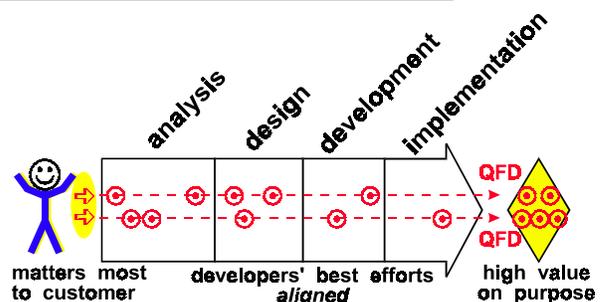


Figure 1. QFD delivers value end-to-end.

What business can afford to waste limited financial, time and human resources on things customers don't want?

VOICE OF CUSTOMER

In its earliest uses in the 1960s, QFD concerned itself primarily with end-to-end alignment of requirements throughout the organization. As internal business processes improved, QFD began to look upstream at where the requirements came from and where improvements could be made. As a result, QFD invited the marketing and sales efforts, traditionally the most customer oriented, to the join. In the ensuing years, QFD has devised numerous tools to bring this fuzzy front end into clearer focus. The following steps are now consistent with QFD Best Practice.

1. Define and prioritize business or organizational goals.
2. Define and prioritize customer segments based on critical business goals.
3. Visit customers in situ, the *gemba*. Map their process. Gather verbatims.
4. Sort verbatims into appropriate dimensions of design and development. Translate verbatims into customer needs – positive statements of customer benefit that are free of any implementation or solution.
5. Get customer to structure the needs from his point of view, which can be different from the organization's.
6. Look for missing, unvoiced or latent needs.
7. Have customer determine which needs are most important and how they measure their degree of satisfaction.
8. Translate top 1-3 customer needs into functional requirements and develop solutions, end-to-end.
9. If necessary, benchmark preferred alternatives.

1. DEFINE AND PRIORITIZE BUSINESS OR ORGANIZATIONAL GOALS

How will your project be judged? By whom? QFD and other cross-functional team members often serve, and are evaluated by, different organizational bosses. Thus, team and business goals could differ from individual performance evaluation factors. Clarification of departmental and team goals is important so that neither customers nor team members are caught in the crossfire of internal battles. This step surfaces and prioritizes business goals for the project. Business or project goal analysis should be done early in the development cycle to assure alignment of cross-functional activities with what matters most to the business. The result should be better alignment of the team and better alignment of the management.

There are many different kinds of QFD for many different kinds of projects. While many of them have in common focus on satisfying a customer, this is not always the case. That is why the QFD process must be tailored to the unique factors you face. The QFD Master Black Belt[®] is trained to tailor QFD to the project needs.

Business goals may vary according to one's organizational role. Be careful to distinguish between different kinds of goals. In QFD we may have

- Business Goals: profit, revenue, market share, brand
- Product Goals: performance, functionality, reliability
- Project Goals: on time, on budget, etc.

2. DEFINE AND PRIORITIZE CUSTOMER SEGMENTS BASED ON CRITICAL BUSINESS GOALS

Which customers will help the project to be most successful?

- A customer is someone you have to satisfy to be successful or who can make you fail.
- Define customers based on characteristics of use. These may be different than standard demographic attributes whose purpose is advertising and promotion. Our purpose here is product design, and so usability, functionality, and appearance issues need to be understood. The Customer Segments Table (**Table 1**) is a good tool for this.
- Which customers will help us most achieve our project goals? Are all customers equally important, or are some more valuable to us than others? Do we have limited resources (time, people, money) to visit customers? If so, how do we best allocate them?
- Plan visit to *gemba*. Determine who is responsible for gathering and analyzing customer information.

A common way to describe the scenario of use is who, what, when, where, why, and how the product or service is used. You may add other columns for factors like market size and share, revenue potential, etc. The Analytic Hierarchy Process (AHP) can be used to prioritize segments directly or based on the business goals.

Who	What	When	Where	Why	How
Patient	Recover their health, to die in peace	24/7, 365	Near home, ER, hospital room, hospice	Specialty care, religious affiliation, doctor has privileges	ER, referral
Patient's family	Comfort patient, advocate for patient, pray	During admission, after patient is admitted	Waiting room, hospital room, chapel, cafeteria	Make decisions, assure patient's needs are met, moral support	Discuss with medical staff, on-line research
Patient's employer	Recover health, rehabilitate injury, preventive care	During disability, after injury, annual physical, healthy living programs	In-patient, physical therapy, satellite clinic, in-company, in-home	Get patient back to work safely, reduce cost of temporary replacement workers, reduce workman's compensation costs	Contract, insurance (HMO, PPO), Plant medical person
Third party payer	Reimburse hospital, physicians	After bills are submitted, Before treatment authorized	Office	Assure procedures are aligned with insurance contract, assure proper billing by hospital, MD	Electronic, web, fax, mail, telephone
Referring physician	Specialty care for their patients, tests	Scheduled, emergency, walk-in clinic	Hospital, ambulatory care clinic	Beyond their clinic's capabilities, exotic illness	Telephone, outcomes report, notification of death

Table 1. Customer Segments Table

3. VISIT CUSTOMERS IN SITU, THE *GEMBA*. MAP THEIR PROCESS. GATHER VERBATIMS

An analysis of what is observed in the gemba can clarify unspoken opportunities for new products and services. After introducing yourself, have the customer walk you through his business processes under consideration. Observe him at work (or daily life for a consumer product) dealing with his problems or his customer's problems. Use the Customer Process Table (**Table 2**) to document the customer's actions, words, smiles, and curses. Do words, facial expressions, and actions agree? Quick movements may convey anxiety; angry, negative words may mean disagreement or fear, etc. Listen with your eyes, ears, and heart to get the complete message. Ask for clarification of problems and opportunities. Some customers may not see themselves as having problems. Encourage these to brag of their accomplishments and "invite" them to join you in the concept phase. Encourage the speaker to tell more by saying, "You seem concerned about..." or "You seem to disagree."

How do we know what is the right customer need to focus on? Gemba: to gain by direct sensory experience (not by reports). Where does the customer benefit from your product? Where does the customer have the problems that your help them with? We want to capture the "raw" untouched voice of the customer. Market research methods that don't go to the gemba are missing something: the details.

The Japanese have coined a word to describe the true source of information — the gemba. In manufacturing, gemba refers to the shop floor. When there is a problem, the engineers go directly to the work area and use their own eyes to see, their own ears, to hear, their own hands to touch, etc. They rely on their own experience, not reported data, to understand the situation.

In QFD, the gemba is where the product or service becomes of value to the customer, that is, where the product really gets used and delivers real value to the customer. It is in the gemba that we really see who our customers are, what their real problems are, how the product will really be used by them, etc. We go the gemba to see our customer's problems and opportunities as they happen.

Unlike other customer information gathering techniques, such as focus groups and surveys, we do not ask questions about problems with our technology or marketing, we do not remove customers to an artificial site such as a meeting room (unless our product is tables and chairs), and we do not rely on customers' memories to report problems to us. Rather, we employ all of our senses using contextual inquiry, video taping, audio taping, direct observation, direct interviewing with customer's employees, etc. for the larger purpose of trying to understand how we can help our customers better conduct their business with their customers.

There is no substitute for a going to the gemba. It can be a life changing experience.

Customer Process	Customer Scenario (observations and verbatims)	Problems and opportunities	Failure Modes
Nurse enters patient room.	39 year old male, admitted through ER for pancreatitis. Presence of gall stones required 4 week stay prior to cholecystectomy. NPO.	I feel fine. I have a busy life to get on with. I am afraid of catching some infectious disease while in the hospital.	Nurse does not ask permission to enter. Privacy not respected.
Nurse carries central catheter tubing.	Nurse brings sealed tubing, wears surgical mask and surgical gloves, asks visitors to leave room, puts mask on pt.	Pt environment kept as sterile as possible during procedure. I am afraid of catching some infectious disease while in the hospital.	Tubing not sealed until at bedside. Non surgical mask or no mask, non-surgical gloves or no gloves. Nurse has cold.
Nurse opens tubing package.	Sealed connectors of tubing must remain sterile.		Tubing uncoils and drops on floor.

Table 2. Customer Process Table

4. SORT AND TRANSLATE VERBATIMS INTO CUSTOMER NEEDS

Dr. Noriaki Kano, a Japanese quality expert, conducted a study of customer satisfaction, using a paired questionnaire: positive question (or not) and inverse question. He demonstrated that to satisfy customers, we must understand how meeting their requirements affects satisfaction. There are three types of customer requirements to consider (**Figure 2**).

Expected Requirements are often so basic the customer may fail to mention them - until we fail to perform them. They are basic expectations without which the product or service may cease to be of value; their absence is very dissatisfying. Further, meeting these requirements often goes unnoticed by most customers. For example, if coffee is served hot, customers barely notice it. If it's cold or too hot, dissatisfaction occurs. Expected requirements must be fulfilled, but fulfilling them beyond what is expected does not increase satisfaction.

Normal Requirements are typically what we get by just asking customers what they want. These requirements satisfy (or dissatisfy) in proportion to their presence (or absence) in the product or service. Fast delivery would be a good example. The faster (or slower) the delivery, the more they like (or dislike) it.

Exciting Requirements are difficult to discover. They are beyond the customer's expectations. Their absence doesn't dissatisfy; their presence excites. For example, if caviar and champagne were served on a flight from Detroit to Chicago, that would be exciting. If not, customers would hardly complain. These are the things that wow the customers and bring them back. Since customers are not apt to voice these requirements, it is the responsibility of the organization to explore customer problems and opportunities to uncover such unspoken items. These requirements can shift over time, segment, or other external factors.

What are "requirements"? We have many excellent specification approaches. And if you have customers who are (1) completely *knowledgeable* about all their requirements, and (2) able to *articulate* them, they work great. But what if we have normal customers? Your customers are untrained at requirements giving. They have no tools or techniques to fully explore their *requirements space*. They are average at articulating what requirements they are aware of. You will not get a complete set of

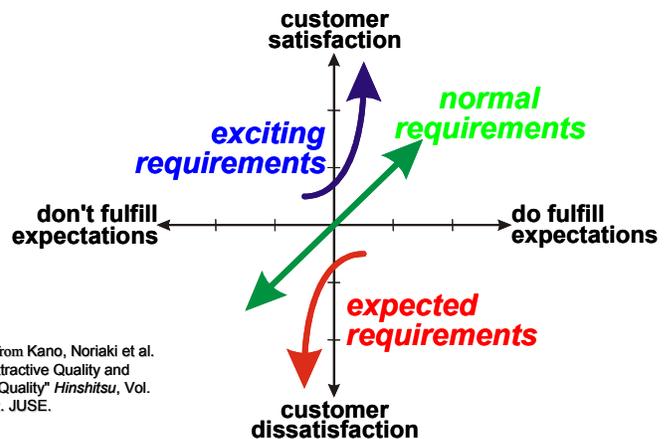


Figure 2. Kano's Model of customer satisfaction

requirements from any customer, ever. Further, even if they could, you don't have the time or resources to do all their requirements anyway, do you?

Fortunately, you don't have to do all the customer's requirements to satisfy them. But to understand why this is the case, we must understand: (1) the relative effect of doing certain types of requirements on customer satisfaction; (2) the relative importance of the customer's requirements, and (3) what 'requirements' are—and how they are different from 'features.' In QFD we take a *very* different approach to exploring and then engineering requirements. We ask customers to define "value" by telling us or demonstrating important problems they face that prevent them from achieving their personal or business goals, by identifying opportunities they cannot currently seize, and by revealing things that make them look good to others or feel good about themselves. These become the starting point for further analysis.

- Problems (negative statements of what is wrong or what needs to be changed) can be reworded into positive needs or benefits (what to change to).
- Opportunities and image issues which are usually already positively stated, can be reworded into needs or benefits.
- Remember, customer problems are not the same as complaints or problems with your product. Customer opportunities are not the same as your product features or solutions. Regardless of how the customer expresses himself, his words or behavior must be analyzed for greater breadth and depth of meaning.
- Don't stop with customer verbatims – they can express the same to your competitors. Advantage belongs to those who make the effort to go beyond the obvious. You must learn both what the customers are saying and why they are saying it. Even if the customer is wrong, it is your responsibility to find out what they really need. *Caveat emptor* has become *caveat venditor*.

The Customer Voice Table (**Figure 3**) is a way to sort the verbatims into categories that are meaningful to the team. The data may be both spoken and observed data learned from the Customer Segments Table, the Customer Process Table, or other analyses done so far. Other sources of data can be complaint reports, warranty data, sales reports, etc. relevant to this customer. Each data item should be singular; complex statements should be decomposed into individual elements as this will make later activities easier to organize and prioritize. The purpose of this table is to first properly sort the data and then to translate any product feature data into detailed customer benefits and needs. Data should be placed in the appropriate column. Categories relate to the customer, solutions, design, project, and even organizational issues.

For example, a patient may request that the curtain in the ER "room" be closed completely to ensure her privacy. The degree of closure is her way of measuring privacy, which is a solution characteristic. The curtain is a component. Her real needs may be to feel unique (opportunity), to have the doctor's full attention (opportunity), to assure that no one she knows sees her in this condition (image), etc.

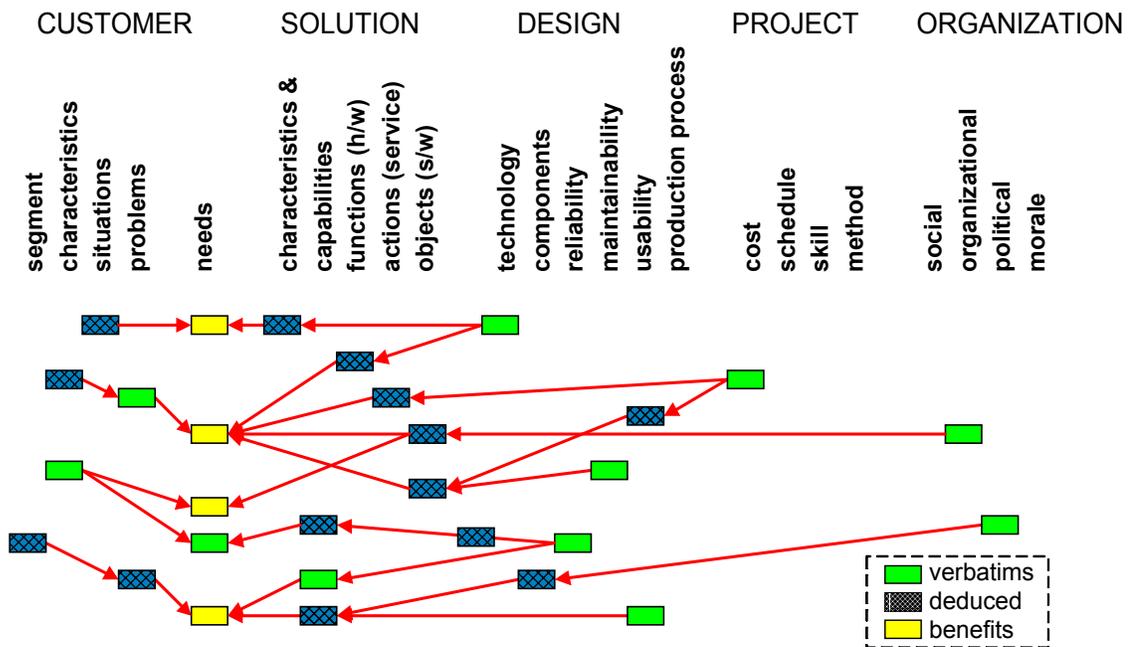


Figure 3. Customer Voice Table (layout)

5. CUSTOMER NEEDS STRUCTURE

Using the KJ Method™ to produce the Affinity Diagram shows us the natural structure of the customers' requirements. The Affinity diagram is produced by the KJ Method™. This is a non-rational “right brain” method, as most people are not aware of what cognitive structure they use for their requirements. It was developed by cultural anthropologist Dr. Jiro Kawakita to surface cognitive structure—to make visible the way the people who do it think about the items operated on. This method is also unique because the grouping categories come after the groups are made, not before. This allows for breaking the paradigms that existing categories place on data. Whose cognitive structure do you want to explore? They should create the Affinity Diagram. Here we want to understand how customers think about their needs.

6. LOOK FOR MISSING, UNVOICED, OR LATENT NEEDS

A Hierarchy Diagram is used to perform three tasks: (1) correct the levels of detail, (2) find missing data, and (3) prevent common errors in subsequent steps such as the House of Quality. The Hierarchy Diagram of customer needs is the basis for analysis to uncover the latent needs that are implied by the needs we have so far.

7. CUSTOMERS PRIORITIZE THEIR NEEDS

The customer needs on the hierarchy diagram must be prioritized by actual customers so we know which needs are how important, and to whom. The Analytic Hierarchy Process (Table 3) is an elegant procedure which provides accurate ratio-scale priorities based on natural language comparisons. (There are other ways to do this, but they are not as accurate, nor do they yield ratio-scale numbers.) Unlike other mathematical models. Such as the multi-attribute theory, AHP does not require rational responses. An inconsistency check quantifies this by looking for instances of $a > b$, $b > c$, $c > a$, etc. A properly organized and prioritized hierarchy can tell us if we have sufficient needs to satisfy the customers. In other words, do we have enough needs that the customer would be satisfied with the product, if we delivered them? We may also ask customers how they measure their degree of satisfaction.

criteria	Feel unique	I know I will be ok	Don't want others to see me like this	Doc's full attention	normalized columns				row total	Row average of normalized columns (RANC)
					a	b	c	d		
Feel unique	1.00	0.33	0.33	1.00	0.13	0.18	0.05	0.13	0.48	0.12
I know I will be ok	3.00	1.00	5.00	3.00	0.38	0.54	0.75	0.38	2.04	0.51
Don't want others to see me like this	3.00	0.20	1.00	3.00	0.38	0.11	0.15	0.38	1.01	0.25
Doc's full attention	1.00	0.33	0.33	1.00	0.13	0.18	0.05	0.13	0.48	0.12
	8.00	1.87	6.67	8.00	1.00	1.00	1.00	1.00	4.00	1.00

Table 3. Customers use AHP to prioritize their needs

8. TRANSLATE CUSTOMER NEEDS INTO FUNCTIONAL REQUIREMENTS AND SOLUTIONS

In the Customer Voice Table, all columns were driven back to explore customer needs. Here we use the Maximum Value Table (Table 4) where key customer needs are driven forward to the various dimensions of design that must be aligned end-to-end in order to assure customer value. The MVT does not of itself kick-off the whole project, but illustrates where we need to do our best in the design and delivery of the product. At this point it is permissible to “over explore” as we can cut back later depending on time, availability of resources, and budget. The columns start with the same set used in the CVT, but new columns may be added to assure end-to-end activity to deliver value to the customer. This is the coherent design process discussed earlier in the course. The MVT may show us areas that have greater complexity or uncertainty, and where matrices need to be done between two design dimensions and at what level of detail. The output are specific tasks and staff actions.

For example, the most important customer need was to know I will be ok. Deploying to the right, we may determine characteristics like time to explain diagnosis; capabilities like getting lab results printing out in the ER suite, patient can find information themselves; technologies like internet access; etc.

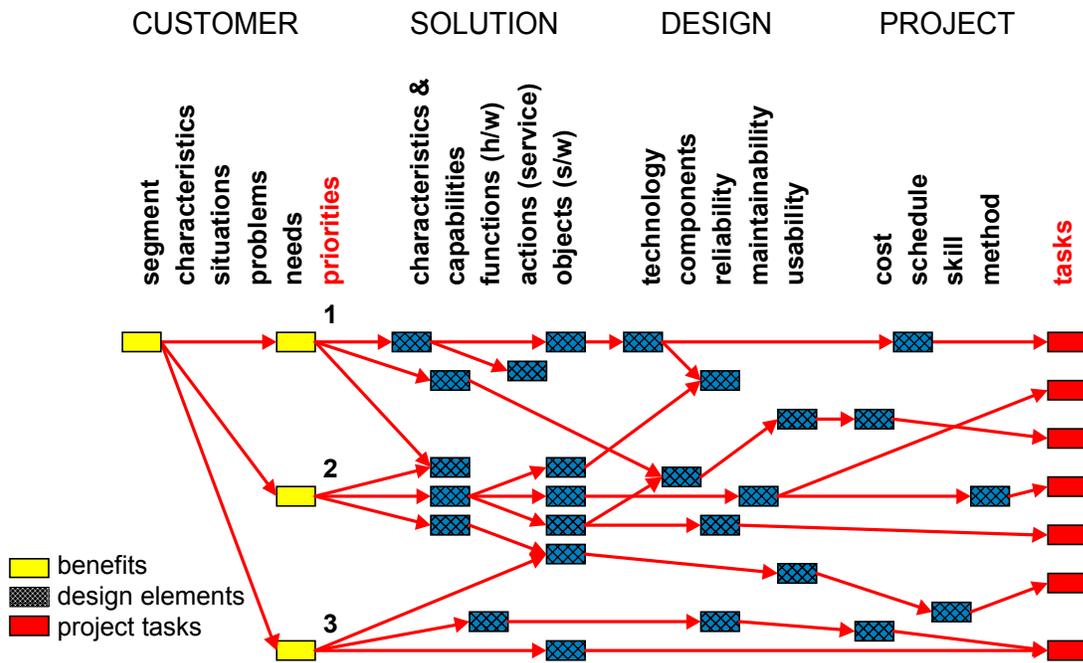


Table 4. Maximum Value Table

CONCLUSION

As shown here, QFD can be used to identify the most important needs of the most important customers and translate them into specific designs and staff actions. The tools can be easily taught to healthcare staff by a QFD Black Belt® and do not require anything more sophisticated than sticky notes and a four-function (+ - x /) calculator.

Dr. Yoji Akao, the co-founder of QFD has authorized the QFD Institute to conduct a series of training programs

1. **QFD Gold Belt®** with executives to decide to do QFD and review goals.
2. Technical review of your development process to tailor QFD to your projects.
3. Introductory tools training: **QFD Green Belt®** on your tailored process.
4. Training and facilitation: **QFD Black Belt®** (during-the-project facilitation and training of facilitators).
5. QFD Specialist: **QFD Master Black Belt®** who will be responsible for future tailoring of your QFD process for different product types.

Details of the courses can be found at www.qfdi.org.

ABOUT THE AUTHOR

Glenn H. Mazur has been active in QFD since its inception in North America, and has worked extensively with the founders of QFD on their teaching and consulting visits from Japan. He is a leader in the application of QFD to service industries and consumer products, conducts advanced QFD research, and is the Conference Chair for the annual North American Symposium on Quality Function Deployment. Glenn is the Executive Director of the QFD Institute and International Council for QFD, Adjunct Lecturer on TQM at the University of Michigan College of Engineering, President of Japan Business Consultants Ltd., and is a senior member of the American Society for Quality (ASQ), and the Japanese Society for Quality Control (JSQC). He is a certified QFD Red Belt® (highest level), one of two in North America.

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