

Using QFD to Improve Technical Support to Make Commodity Products More Competitive

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Abstract

How does one take a commodity that is essentially unchanged for hundreds of years and develop a competitive position that is based on something more than price? GCC, a cement company from Mexico with expanding sales in the US, used QFD to create customer value that set them apart from competitors without resorting to a bottom price. This paper details the journey that started with well planned *gemba* visits, as well as a one-year follow up to this QFD study.

Key Words

Quality Function Deployment, QFD, Cement, commodity, gemba

Overview of cement industry

Cement is often confused with concrete. Cement is the gray powder chemically manufactured from ground limestone and other additives. Most GCC RIO GRANDE cement is sold in bulk by the ton. Large tank trucks, called pneumatics, deliver cement to most customers, where it is blown into silos. Cement can also be sacked and sold through a distribution system that includes home improvement centers. GCC RIO GRANDE'S biggest customers are ready-mix concrete producers. The concrete they produce is used to make floor slabs, buildings, bridges, pavements, and other products limited only by one's imagination. Concrete, and therefore cement, is the most widely consumed building product in the world.

To ensure consistency, the characteristics for cement products are carefully defined by standards established by the American Society of Testing and Materials (ASTM). ASTM also establishes standard specifications for different types of concrete. Product differentiation among manufacturers is small, especially throughout a particular region. Cement is considered a commodity, although new uses are being discovered

GCC RIO GRANDE - Company overview

GCC RIO GRANDE owns New Mexico's only cement manufacturing facility. The plant is located near Albuquerque in Tijeras, NM, and services central and northern New Mexico. The Tijeras plant has a theoretical production capacity of 500,000 short tons. An additional 500,000 tons of cement is sold through cement distribution terminals in downtown Albuquerque and El Paso. Product for these facilities is either

imported from Mexico or purchased domestically. The GCC RIO GRANDE market is southwestern Colorado, most of New Mexico, and El Paso.

Grupo Cementos de Chihuahua (GCC), a Mexican building materials manufacturer, owns the facilities. GCC, whose headquarters are in Chihuahua City, operates hardware, gypsum, cement, concrete and concrete block businesses in Mexico. In the United States, GCC also owns a cement manufacturer in Rapid City, South Dakota (GCC Dakotah) and concrete operations in El Paso and southern New Mexico (Rio Grande Materials).

GCC - A Culture of Quality

Quality is part of the culture of all of the GCC companies. GCC Planta Samalayuca, a cement plant located near Juarez, Mexico, won the prestigious Premio Nacional de Calidad – the Mexican equivalent of the Malcolm Baldrige award in the United States. GCC RIO GRANDE has used a continuous improvement program since 1995, Baldrige Assessments since 2000, and began QFD in 2001. GCC RIO GRANDE plans to apply for the Malcolm Baldrige award in 2003.

The GCC RIO GRANDE Customers

GCC RIO GRANDE has a small customer base. Direct customers fall into three major categories, 1) ready mix customers, 2) pre-cast concrete and concrete block customers, and 3) home improvement centers (retail). By number:

- The top 5 customers account for 62% of sales. These are mostly ready-mix companies that mix cement to make concrete for roads and large structures
- The top 20 customers account for 85% of sales
- 78% of sales are to ready mix concrete producers - Approx. 20 accounts
- 7% of sales are to concrete block manufacturers – 7 accounts
- 10% of sales are to lumberyards and sacking companies, such as Quikrete.

This small customer base makes it easy to contact all major and most minor customers regularly. However, because losing a major customer has a significant impact on sales, customer relationships are vital to the prolonged maintenance of the GCC RIO GRANDE market share.

Why QFD?

GCC RIO GRANDE enjoys nearly an 85% market share and 100% in central New Mexico. However, cement manufacturers in Texas, New Mexico and Arizona have expanded their production capacities. Potential competitors have conducted market studies for New Mexico, and plan to ship cement into the region.

Because cement properties are dictated by specification, differentiation between products is usually not much of a driver of the purchasing decision. Cement companies often enter a market by lowering the price, and price wars sometimes develop. Obviously, GCC RIO GRANDE hopes to avoid having to compete by price.

The challenge to GCC RIO GRANDE, therefore, was, through relationships and value-added services, to provide value beyond that of the cement product. GCC RIO GRANDE has developed programs over the years to meet customers' needs, however, the questions GCC RIO GRANDE wanted and continue to want the answers to are:

1. What are the customers spoken and unspoken needs?
2. How does GCC RIO GRANDE provide solutions for their customers?
3. What added value will help drive the decision to purchase cement from GCC RIO GRANDE?

The concrete market, through acquisitions, mergers, and changing personnel, has needs that constantly change. The needs of large concrete producers are different than those of smaller companies. To continue their success, GCC RIO GRANDE must be able to recognize these changing needs and respond.

Quality Function Deployment is a tool that has a proven record of guiding successful programs to answer the voice of the customer. Although sales people visit customers regularly to develop relationships and perform services, GCC RIO GRANDE needed a method to validate, refine, and adapt these sales programs to a changing marketplace.

To satisfy customers, GCC RIO GRANDE needed to understand how meeting their requirements effected satisfaction. We learned there are three types of customer requirements to consider (**Figure 1**) [Kano et. al 1984].

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

Expected Requirements are often so basic the customer may fail to mention them - until we fail to deliver them. They are basic expectations of the service, without which the 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 an airplane takes off safely, passengers barely notice it. If it fails to take off safely, dissatisfaction is intense. Expected requirements, though unspoken, must be fulfilled.

Exciting Requirements are difficult to discover. They are beyond the customer's expectations. Their absence doesn't dissatisfy; their presence excites. For example, if champagne and steak were served in coach class on a flight from Albuquerque to Santa Fe, passengers would be ecstatic but if the food was more mundane, passengers would not complain. These are the things that wow, that win new customers and keep the old ones coming back. Customers are may not even be aware such service even exists, and so these requirements go unspoken. Thus, it is the responsibility of the service organization to explore customer problems and opportunities to discover these new levels of service.

Kano's model is also dynamic in that what excites today becomes expected tomorrow. That is, once introduced, an exciting service will soon be imitated by the competition and customers will come to expect it from everybody. An example would be free evening and weekend mobile telephone minutes – initially an advertising ploy by one provider, and now available from all providers. On the other hand, expected requirements can become exciting after a real or potential failure. An example might be the passengers applauding a pilot who has safely maneuvered a landing despite severe weather conditions. The Kano Model has an additional dimension regarding which customer segments the target market includes. For example, the champagne and steak that might be exciting in the coach section might be expected on the New York to Paris Concorde flight. Knowing which customer segments you wish to serve is critical to understanding their requirements.

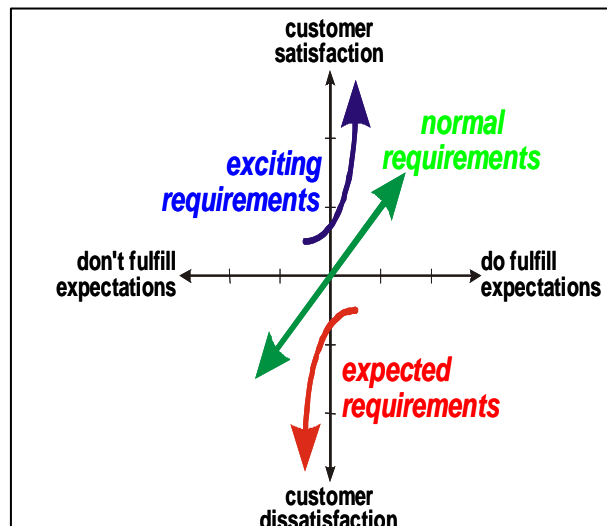


Figure 1. Kano's Model of Quality.

Thus, eliminating service problems can be likened to expected requirements. There is little satisfaction or competitive advantage when nothing goes wrong. Conversely, great value can be gained by discovering and delivering on exciting requirements ahead of the competition. QFD helps assure that expected requirements don't fall through the cracks and points out opportunities to build in excitement.

We wanted to go beyond just elimination service problems for the following reasons. Kano's model helped put these into perspective.

- Competition is on the way – very important for us to work on relationships (expected).
- With only one choice, customer has no basis for comparison (normal).
- Identify a way for us to show value beyond the price of cement (exciting).
- Compete with competitors without a price war (normal).
- Important to identify customers' needs and exceed them (exciting).
- Recognize that customers' needs change, and adapt to these changes (normal, expected, exciting).
- Incorporate the entire organization into answering the voice of the customer (normal).

Our QFD process

Our parent company, GCC, had been exposed to QFD already, and recommended Mazur to train us. Using the newly developed QFD Institute "belt" program, he custom-tailor the QFD process to the unique circumstances of our company and project – i.e. the commodity product, etc. Seventeen members including Enrique Escalante, President of GCC of America, Martin Cerecer, Organizational Effectiveness Internal Assessor, Jaime Fernandez, Corporate Planning Manager, William C. Webb, Vice President Sales & Marketing of Rio Grande Portland Cement Corporation, Steve Zellmer, President of GCC Dacotah, Henry

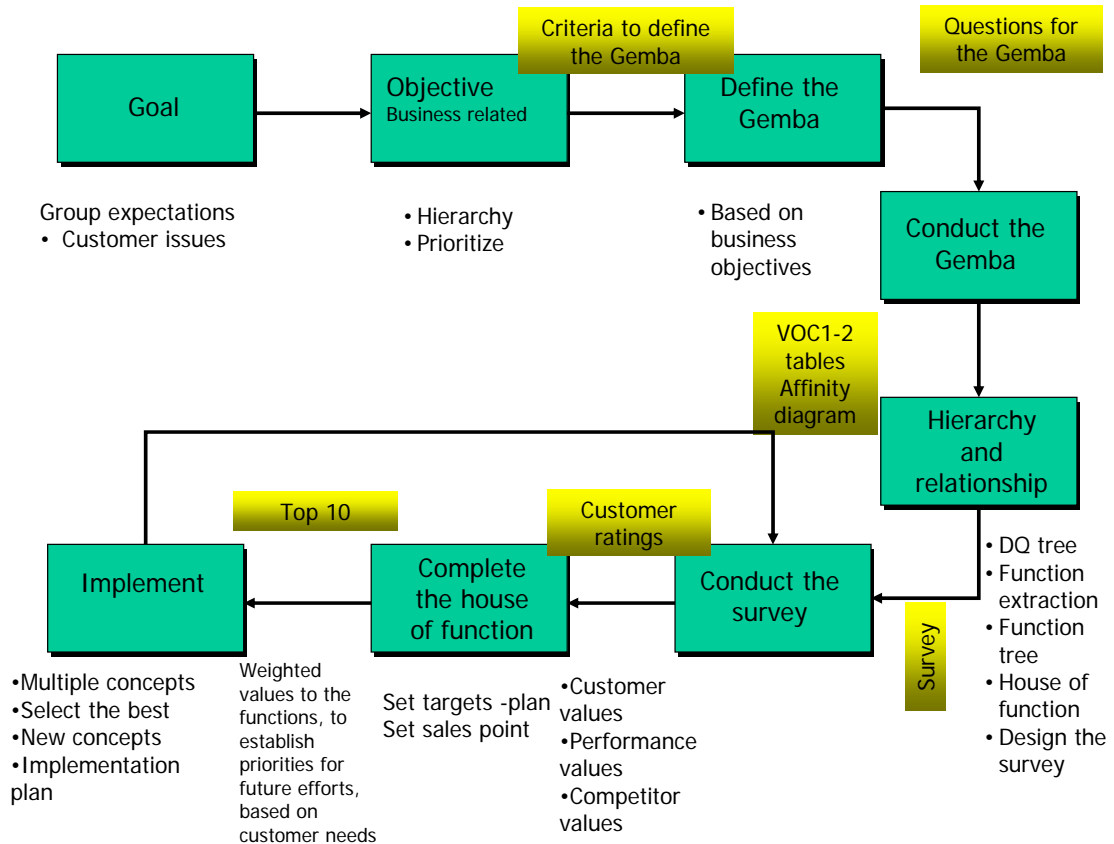


Figure 2. Tailored QFD process for GCC.

McKitterick, Vice President Sales & Marketing of GCC Dacotah, as well as sales managers, technical service engineers, service specialists, and the TQM manager. After completing the QFD Green Belt[®] 2-day introductory course in June 2001, all but two went on to complete the QFD Black Belt[®] facilitators course in July and August 2001.

First, Mazur helped tailor a conceptual model for our QFD, as shown in **Figure 2**.

The core GCC RIO GRANDE team, Henry H. Hearon, Sales Manager, William C. Webb, VP Sales & Marketing, Richard Percival, Market Manager, and Rickard D. Dyke, Market Manager, began by identifying project goals and key customer segments. Goals such as profit, sales volume, and market controllers were clarified, prioritized, and quantified using the Analytic Hierarchy Process [Saaty 1990]. Key customer segments and how to conduct customer visits were coordinated with the GCC Dakotah people. Mazur helped us redesign our customer surveys by rewording questions in a more QFD-friendly way. For example, “How do you find the Quality of our Product?” became “Have you experienced any problems with the performance of our product or any of our services? Please share any details you can so I can investigate further. What problems did we create for you and your customers?” This rewording was key to convincing our customers that this was more than just a courtesy sales call and that we were seriously interested in details.

Next, we visited key customers to document their cement use and concrete production processes. At customer “W” we met with the president, operations manager, and the accountant. We examined their materials handling process and logistics process, and then studied the paperwork process in the office. Here we learned that our pricing and quotation strategies were often perceived as guessing and inconsistent with the future needs of their customers – the general contractors. A customer process table was constructed with additional data to match the customer’s problems and opportunities with internal GCC processes (**Table 1**). Visits were made to ten additional critical customers as defined in our Customer Segments Table (**Table 2**).

Table 1. Customer Process Table mapping customer problems to GCC processes (partial).

PROCESS	SCENARIO	W PROBLEMS/OPPORTUNITIES	GCC SERVICE ELEMENTS
1. Concrete pricing and bidding (Steve Hooper)			
Customer contact	Customer either calls W sales office or W sales office contacts customer regarding concrete price for a project.	W needs to be available whenever customer calls for a concrete price.	GCC pricing office hours.
		W needs to be able to respond quickly.	GCC response time.
		W sales office contacts customers.	GCC notifies W of price changes.

Table 2. GCC Customer Segments Table (partial).

Who (Direct)	Who Specifies	Who Uses	What (Product)	What (Service)	When	Where	Why	How
ReadyMix	Engineers	Concrete Contractors	Bridges	Promotion	Preconstruction	On-site	Correct problem	Face-to-face
Pavers	DOT	Masonry Contractors	Streets	Trouble shooting	Pre-design	Off-site	Durability	Web
Precasters	Beaureau Rec	Stucco	Highways	Sales	At placement		Future Sales	Paper
Block Plants	State Gov't	Homeowners	Parking Lots	Specification	Post-construction		Build Loyalty	Phone
Oil Fields	Federal Gov't	Batch Person	Driveways	Tech Assist	Spring		Education	PDA

From the customers’ problems and opportunities statements, we sorted them on the basis of whether each represented a customer need (demanded quality) or a product/service feature (quality attribute, service function, fail point, etc). This is done in the Voice of Customer Table -2 as shown in **Table 3**. This table is an essential piece of the QFD process because it is used to analyze customer statements and determine the *true* needs represented by these statements. Demanded Quality statements must be implementation-

independent so that new solutions can be developed to better satisfy the customer better than the current alternatives. Giving the customer only what they ask may not be enough.

Table 3. Voice of Customer Table (partial).

Problem & Opp Statements from Cust Proc Tbl	Demanded Quality (true customer needs, benefits, independent of solutions)	Service Quality Attributes (service quality metrics)	Svc Functions (purpose of the service, verb + object)	Processes (how the function is currently done, or could be done)	Tasks/Jobs (steps in the process)	Equipm't (tangible solutions - hardware, software, machines, vehicles, etc.)	Svc Fail Points (what could go wrong)	Other
Pricing of cement	predictable pricing strategy							
7 day strengths lower than Odessa	does he really need high 7 day strengths ?	strength monitoring	evaluate projects		Evaluate 28 day plus strength - should be better	customer visit, statistical evaluation		
Doesn't know where cement truck is	On time delivery	scheduling	track trucks	Internet system to locate trucks	Technology partnerships with trucking companies	GPS and internet systems	Doesn't work No use	
El Paso terminal not open at night, etc.	adequate cement inventory	inventory level	load trucks on time	pre-load trucks	communicate with customer	use e-mail to terminal		

Unlike assembled or manufactured product QFDs, service QFD often deploys directly to service functions. To develop a list of current and potential service functions, we can use the Demanded Quality statements as a prompt. **Table 4** shows how this is done. The service functions were then organized by organizational functions and juxtaposed with the Demanded Quality into a House of Function (**Table 5**). The intersecting cells indicate the strength of the relationship between each function and each Demanded Quality.

Table 4. Function Extraction (partial).

Demanded Quality (Customer needs and Goals)	Service Functions					
3rd						
Predictable Pricing Strategy	Promote fair pricing within competitive boundaries	Do competitive pricing research	Obtain competitors' price increase letters from customers	Offer price protection on carry-over work	Offer competitive pricing for competing materials	Promote fair pricing within competitive boundaries
Market Sensitive Pricing	Do competitive pricing research	Obtain competitors' price increase letters from customers	Promote fair pricing within competitive boundaries	Offer Long-term contracts	Offer pre-pay discounts	Train in anti-trust laws

The next step was to get customer to prioritize their needs, the Demanded Quality, and to ask them to compare our current services with those of competitors. A questionnaire was created for the sales force to take to customers, as shown in **Table 6**. The responses are entered into the Quality Planning Table section of the House (not shown for confidentiality reasons) to calculate Demanded Quality Weights and Service Function Weights using the standard QFD matrix calculations. The output of this table is the identification of key service functions to be improved, which are explained below.

Table 5. House of Function (partial).

Function			Establish Pricing Strategy						Billing			Collect Money				
			Promote fair pricing within competitive boundaries			Offer Long-Term Contracts			Ensure pricing mgr has info to bill correctly							
Demanded Quality			Do competitive pricing research	Follow Applicable pricing laws	Fair discounts to all customers	Enforce Discounting policies	Establish discounting policies	Offer pre-pay discounts	Offer price protection on carry-over work	Bill correct customer	Issue Credits	Assure billing software is up-to-date	Apply finance charges	Past due accounts receivable are up to date	Notify salesmen when past-due payments are received	Speedy clearing of lock boxes
1st level	2nd	3rd														
Good Service	Improves Customer Efficiency	Customer Up-Time Delivery														
	Good Promotion	Industry Recognitio														
		Expanded Market														
	Pricing	Predictable Pricing Strategy	9	9	9	9	9	9	9	9	9	9	9	9	9	
		Market Sensitive Pricing	9	9	9	9	9	9	9	9	9	9	9	9	9	

Improvements for 2001

Our *gemba* visits revealed the following customer needs to our QFD team.

1. Pricing was the most important issue for our customers.
2. Our assistance with technical problems was valuable to our customers.
3. The GCC RIO GRANDE pricing strategy was the universal problem that GCC RIO GRANDE had to address. Because customers had no other choices from whom to purchase cement, price increases usually brought a wave of complaints.

Sales people have long understood this. However, the QFD process revealed that by timing price increases with certain customer practices, relationships could be improved. For example, many customers budget for a calendar year. GCC RIO GRANDE often issued letters of notice in March for a September price increase.

Table 6. Customer Questionnaire (partial).

<p>How important is improving your efficiency?</p> <p>Up-time of your operation Delivery of concrete</p>	<p>1 2 3 4 5</p> <p>1 2 3 4 5 1 2 3 4 5</p>		
<p>How important is concrete promotion to your market and the industry?</p> <p>Project and workmanship recognition within the concrete industry Expanding your product market</p>	<p>1 2 3 4 5</p> <p>1 2 3 4 5 1 2 3 4 5</p>		
<p>How important are predictable raw material costs?</p> <p>My cement price is competitive Frequency of cement price changes</p>	<p>1 2 3 4 5</p> <p>1 2 3 4 5 1 2 3 4 5</p>		

GCC RIO GRANDE believed that, because of the early notice, customers had time to plan their cost and pricing structures. However, with a mid-year price increase, many customers would still experience a negative budget variance. Additionally, customers often bid work in January for one year. Customers were unable to raise their prices to recover the additional cement cost.

GCC RIO GRANDE has always had a technical services department to assist customers with field problems. Concrete is delivered as a raw material, and is sometimes mishandled at construction sites. The resulting problems are often blamed on our customer, the concrete company. GCC RIO GRANDE often acts as a third party consultant to resolve these issues. However, the process was often viewed as a means to defend the company against accusations that concrete problems were traceable to the cement. QFD showed GCC RIO GRANDE that technical services are important to customers as a value-added service, and efforts should be expanded, streamlined, and updated. The Voice of the Customer also was that, rather than waiting for a problem to develop, educational programs would improve workmanship and prevent problems from occurring.

Improvements for 2002

The 2001 questionnaire is being used to measure (important for our Malcolm Baldrige application) whether GCC showed improvements in areas the customers identified as problems.

It was unrealistic for GCC RIO GRANDE to tell customers that there would never be price increases. The customers understand this, also. QFD Gemba visits revealed that all of the major customers' budgets coincided with the calendar year. So, GCC RIO GRANDE changed their strategy to meet these needs. Sales people met with decision-makers in June or July, and gave them a projected price, effective January 1. If GCC RIO GRANDE, after reviewing their financials for the year, decided to go ahead with a price increase, the customer would be prepared. Smaller customers do not always have formal budgeting processes, but they also indicated that January 1 is better.

The Technical Services Department changed as well. Educational programs used to be based on photographic slides, some of which were outdated. Programs were not well defined, and were conducted on as-requested bases.

The GCC RIO GRANDE Technical Services Director first took classes to upgrade his computer based presentation skills. He then converted most of the old slides to a digital format, adding new ones to replace

those that were obsolete. Eleven programs were organized, and equipment was purchased to take the presentations to both the primary and secondary customer.

Gemba visits were structured to define which customers desired assistance with technical services and could benefit from the various programs. An interesting QFD discovery was that customers were interested not only in customer training, but training for their employees, as well.

Rather than continuing with a program that was largely reactive, GCC RIO GRANDE aggressively organized a program to saturate the market. In 2001, GCC RIO GRANDE performed approximately 10-12 training sessions. As a result of the findings in the QFD study, GCC RIO GRANDE organized over 30 different sessions in 2002.

Results to date

Other cement companies have, in fact, solicited business on the border areas of New Mexico. GCC RIO GRANDE fared very well.

1. **Western New Mexico:** A GCC RIO GRANDE customer told one of their competitors that he would not change, because GCC RIO GRANDE assists him with concrete promotion
2. **Northeastern New Mexico:** Although a Colorado manufacturer has a slightly better price than GCC RIO GRANDE, the customer would not switch because GCC RIO GRANDE regularly helps him with problems concerning finished concrete.
3. **Southeastern NM:** GCC RIO GRANDE lost business in 2001, because of a lower price from a cement manufacturer in Texas. This year the customer has allowed GCC RIO GRANDE to re-negotiate their business, largely because GCC RIO GRANDE identified their need for assistance with a state trade association.

Future plans for QFD

- GCC RIO GRANDE may have new cement products available to possibly introduce in the future. QFD will be used for market feasibility research.
- The concrete industry, formerly dominated by small entrepreneurial enterprises, is changing to one with large, high tech owners. GCC RIO GRANDE's next QFD study will be used to identify potential partnerships with technology.
- QFD could also be an excellent tool for GCC RIO GRANDE's concrete customers. The GCC RIO GRANDE sales staff have achieved QFD Black Belt[®] status, and plans to possibly train customers in the use of the technique.
- Smaller customers often have problems coping with business issues, such as accounts receivable, environmental problems, and potential e-business opportunities. QFD will be used to identify possible solutions.

Summation

Identifying opportunities in an industry that has little product differentiation is difficult. Often, many companies look to price as the only way to increase market share. Through QFD, GCC RIO GRANDE has taken steps to create customer loyalty. The reality is that some customers will always buy a particular product based on price. However, QFD showed GCC RIO GRANDE that, by listening to the Voice of the Customer, buying decisions might be influenced in more profitable ways.

About the Authors

Henry H. Hearon, *QFD Black Belt*[®], is the Sales Manager for GCC RIO GRANDE. He has over 24 years of sales experience with cement and concrete-based products, including ready mix concrete, concrete block, and related building materials. Mr. Hearon is one of the leaders of the team that recently wrote and submitted an application for Quality New Mexico's Zia Award – a process similar to that of the Malcolm Baldrige National Quality Award. He has served as an examiner for 3 years with Quality New Mexico, and is a Director for Albuquerque Quality Network. In 2001, Mr. Hearon was presented with the Portland Cement Association's National Promotion Progress Award for his efforts to assist the New Mexico concrete industry with product promotion.

Glenn Mazur, MBA, has been the voice of QFD as Drs. Akao, Mizuno, Ohfuji, and Fukuhara's translator and interpreter since QFD's earliest inception into the United States in the mid-1980s. He is an adjunct faculty teaching TQM at the University of Michigan College of Engineering, Executive Director of the QFD Institute, Executive Director of the International Council for QFD, and president of Japan Business Consultants, Ltd. He is a senior member of the American Society for Quality, Japan Society for Quality Control, and a nominee to the International Academy for Quality. His awards include the 1998 Akao Prize for Excellence in QFD and Certificate of QFD Mastery (QFD Red Belt[®]) by Akao in 2000. Among his books and publications are *Comprehensive QFD for Products*, *Comprehensive QFD for Services*, *Comprehensive QFD for Food Products*, *QFD for Small Business*, and *Policy Management: Quality Approach to Strategic Planning*. Mazur can be reached at glenn@mazur.net and www.mazur.net.

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