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## ***Using Quality Function Deployment***

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## *Using Quality Function Deployment*

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### Abstract

Three recent trends have led to changes in the way travelers view airport food; (1) healthier and lighter food, (2) more women travelers, and (3) fewer on-board meals being served. Host Marriott, which operates 70% of the U.S. airport food and beverage market, wanted to assure that its product offerings were keeping up with customer demands. What they discovered was that their traditional approach to new product and service development was penny profit driven and not customer focused. QFD was employed to make quality and customer satisfaction more important. What ensued startled us all: within two weeks sales were up 50%, and after one year sales had evened out at more than double their previous year's level.

**Key words:** QFD, Service Quality, Food Products, Bagels.

### Company Profile

Host opened in 1897 as a purveyor of food, beverage, news, and general merchandise in train stations, the leading form of mass land transportation at that time. We have continued to serve that market by now controlling over 70% of the food and beverage sales in U.S. airports. We also operate food, beverage, and merchandise facilities in travel plazas on 12 east coast and midwestern highways.

Host currently commands \$1.2 billion in sales per year from its over 2,000 units in 170 locations worldwide. Over 40 different types of regional and international branded products, such as Burger King, Taco Bell, TGI Fridays, etc., make up 65% of this business.

Our approach to developing new products and services has been primarily localized, with each operation identifying the needs of its market, sourcing new products, testing them, and keeping the ones that worked. That is, a loose, vaguely defined process. The two driving forces behind this were 1) to get a product that fit the category at the lowest price tag in order to drive the penny profit and cost of sales margins and 2) how much free equipment the vendor would provide. Customer input was not normally sought before or after that. Core items (coffee, hot dogs, baked goods, etc.) were secured through national contracts also driven by price and sales margins. Merchandising and delivery to customers were handled in the traditional way where *we* determined what was to be done. Customer usage issues were not normally considered.

In 1994, we began a strategic planning process to assess our strengths for the rest of the decade. Specific competitive opportunities were identified that exploited the competencies we had built up over

the last century. Several task forces were commissioned by Tom O'Hare, Vice President of Operations, set up to explore ways to improve product quality. Some of the task forces focused on core items like hot dogs, baked goods, deli, etc. We felt, however, that given our widespread activities and the importance of these new business directions, a more unified new product development process (NPD) was needed to assure that the quality of the output could be maintained from the strategic planning phase down through concept and delivery of the service.

Through our work with GOAL/QPC, a Massachusetts based quality training organization, we were introduced to quality function deployment and to Glenn Mazur of Japan Business Consultants and the QFD Institute, one of the leading proponents of the methodology in North America.

## Why QFD for new service planning and development?

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

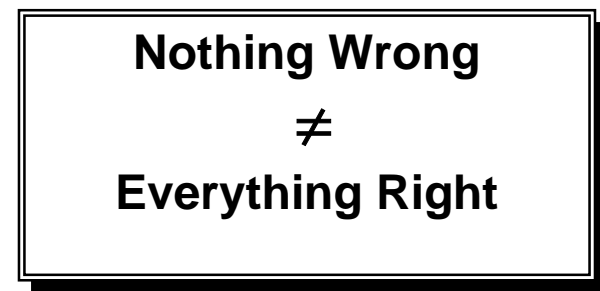
Traditional approaches to assuring quality often focus on work standards [Love 1986], automation to eliminate people, or in more enlightened organizations, Quality Improvement Teams to empower employees to resolve problems.

As organizations are finding out, however, consistency and absence of problems are not enough of a competitive advantage when 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.

### Modern Quality Systems

QFD is quite different from traditional quality systems which aim at minimizing negative quality (such as poor service, broken product). With those systems, the best you can get is *nothing wrong* - which is not enough when all the players are capable. In addition to eliminating poor service, we must also maximize positive quality (such as convenience, enjoyment). This creates **value**.



**Quality Function Deployment (QFD)** is the only comprehensive quality system aimed specifically at satisfying the customer. It concentrates on maximizing customer satisfaction (positive quality) - measured by metrics such as repeat business. QFD focuses on delivering value by seeking out both spoken and unspoken needs, translating these into actions and designs, and communicating this throughout the organization. Further, QFD allows customers to prioritize their requirements, benchmark us against our competitors, and then direct us to optimize those aspects of our organization that will bring the greatest competitive advantage. What business can afford to waste limited financial, time and human resources on things customers don't want or where we are already the clear leader?

### History of QFD

Quality Function Deployment began thirty years ago in Japan as a quality system focused on delivering products and services that satisfy customers. To efficiently deliver value to customers, it is nec-

essary to listen to the “voice” of the customer throughout the product or service development process. The late Dr. Shigeru Mizuno, Dr. Yoji Akao, and other quality experts in Japan developed the tools and techniques of QFD and organized them into a comprehensive system to assure quality and customer satisfaction in new products and services [Mizuno and Akao 1994, Akao 1990].

In 1983, a number of leading North American firms discovered this powerful approach and have been using it with cross-functional teams and concurrent engineering to improve their products, as well as the design and development process itself [Akao 1983, Sullivan 1986, King, 1987]. Service organizations have also found QFD helpful. The author used QFD in 1985 to develop his Japanese translation business, **Japan Business Consultants**, and saw revenues increase 285% the first year, 150% the second year, and 215% the third year [Mazur 1993c]. QFD was an important part of **Florida Power & Light**'s successful bid to become the first non-Japanese Deming Prize recipient in 1990 [“Quality System Implementation...” 1988, Webb 1990, Bodziony 1995] and in the 1994 Deming Prize awarded to **AT&T Power Systems**. It has been successfully applied in the U.S. healthcare industry since 1991 at **The University of Michigan Medical Center** [Gaucher 1991, Ehrlich et al 1993, Ehrlich 1994], **Baptist Health System** [Gibson 1994, 1995], and other leading institutions. Interesting service applica-

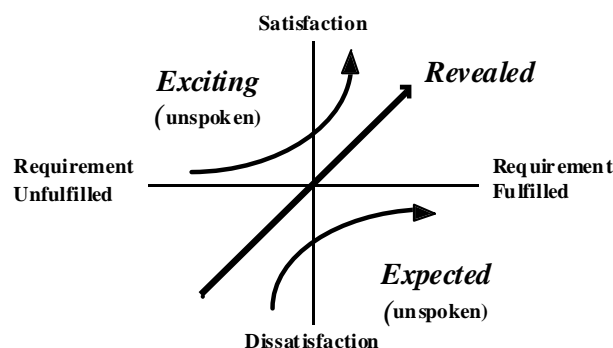
tions also include the author's development of an engineering TQM curriculum at **The University of Michigan College of Engineering** and the application to employee satisfaction and quality of work life at **AGT Telus** [Harries et al 1995]. Each year new applications are being reported in small businesses as well [Mazur 1993c, 1994a]. Since 1990, the author has consulted with other service organizations in distribution, education, food service, personnel, finance, healthcare, repair, retail, and transportation businesses.

Early applications of QFD in service organizations in Japan by Ohfuji, Noda, and Ogino in 1981 were for a shopping mall, a sports complex, and a variety retail store [Akao, 1990]. More recently, Kaneko has been integrating QFD, reliability, and quality circle activities in hotels, shopping centers, and hospitals [Kaneko 1990a, 1990b, 1991, 1992].

QFD has been heralded for such benefits as promoting cross-functional teams, improving internal communications between departments, and translating the customer's needs into the language of the organization.

### Types of Requirements

To satisfy customers, we must understand how meeting their requirements effects satisfaction. There are three types of customer requirements to consider (see Figure 1) [Kano, *et. al.*, 1984].



**Figure 1. The Kano Model (adapted).**

Service businesses must meet all three types of requirements - not just what the customer says.

**Revealed 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.

**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.

**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.

Kano's model is also dynamic in that what excites us today is expected tomorrow. That is, once introduced, the exciting feature will soon be imitated by the competition and customers will come to expect it from everybody. An example would be the ability to have pizza delivered in thirty minutes. On the other hand, expected requirements can become exciting after a real or potential failure. An example might be when the passengers applaud after a pilot safely lands the airplane in rough and stormy weather.

The Kano Model has an additional dimension regarding which customer segments the target market includes. For example, the caviar and champagne that's exciting on the domestic flight might be expected on the Concorde from New York to London. Knowing which customer segments you serve is critical to understanding their requirements.

Thus, eliminating problems handles 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.

In summary, Kano found that the exciting needs, which are most tied to adding value, are invisible

to both the customer and the provider. Further, they change over time, technology, market segment, etc. The Japanese creators of QFD developed tools such as the Voice of Customer Tables [Akao 1990b, Ohfuji et al 1990, Nakui 1991, Marsh et al 1991, Mazur 1991a, 1991e, 1992c, 1993a, 1993c] and coupled them to affinity diagrams and hierarchy diagrams to break through this dilemma.

This process works best when the QFD team goes to *gemba* (where the customer interfaces with the service) to observe, listen, and record the problems customers experience and the opportunities they wish to seize. The voice tables provided a structure for recording the data. Going to the *gemba* can be difficult for those who are used to seeing things from an internal point of view. They tend to see more process problems and solutions than customer needs. Systematic tools can help the QFD team see the world from the customer's point of view.

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## Customizing the QFD road map for Host Marriott

Although Host had previously experimented with the House of Quality, this was their first attempt at Comprehensive Service QFD [Mazur 1993a]. In order to thoroughly examine all facets for applicability beyond the current project, they elected to explore all the deployments in Comprehensive Service QFD. The standard deployments are explained in Table 1.

### Getting executive buy-in

The customization process began in March, 1995 with a one-day QFD overview presented to executives of both Marriott International and Host. Marriott attendees included Sam Bonfe, Director of Catering Standards MHRS, Jim Burns, Brand Executive, Jeff Brindle, Mary Scott, and Griff Lindsay from the New Business Team, and Helena Light-Hadley, Director of TQM MHRS. From Host came Jim Boragno, Sr. VP Products and Standards, Suzie Hill, Director of F&B Standards,

Dick Knockerbocker, Director of Procurement, Bob Stanton, General Manager and OTL - Washington, D.C., Cindy Lynch, Food and Beverage Standards - St. Louis, and Ed Rudis, General Manager and OTL - Minneapolis. The meeting was hosted by the author, Steve Lampa, then Vice President of TQM and featured Glenn Mazur as the subject matter expert.

The purpose of this meeting was to expose these executives to the methodology so that they could participate in determining whether QFD should be adopted as the standard new product and service design process. At this meeting, it was determined to do a pilot QFD project at the Phoenix Sky Harbor International Airport around improving baked goods products.

As a service, there are fewer large capital investments than in manufacturing companies, and it is possible to experiment in a “living lab” and make modifications relatively quickly. QFD should be tailored to address these simpler business needs.

Deployment	Purpose
Customer Deployment	To determine which customers and gembas are critical to our success.
Voice of Customer Deployment	To understand the <b>true</b> needs of the customer through analysis of spoken and unspoken requirements and context of use.
Quality Deployment	Prioritization of customer needs and translation of them into service measures.
Function Deployment	To identify and prioritize required and new activities without identifying how they are to be performed.
Reliability Deployment	To identify and preclude failpoints from a process.
New Process Deployment	To conceive and select alternative ways to perform the above functions.
Task Deployment	Detailed breakdown of the selected process to identify responsibility and performance requirements.
Standardization	Job descriptions and standard operating procedures to hold the gains.

Table 1. The standard deployments of Comprehensive Service QFD.

Not everything in our core businesses need to be new and innovative products, so this limited trial helped us to find an appropriate depth.

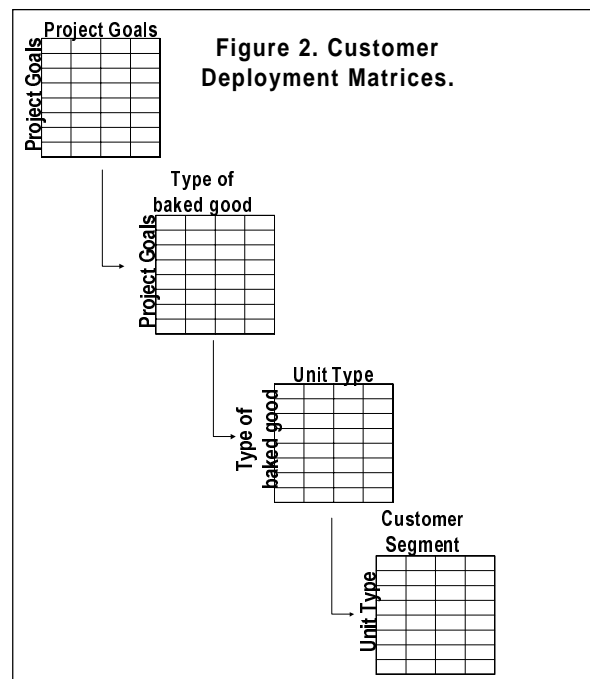
The Phoenix team was lead by Wayne Eddy (Multi-unit Manager Terminal 3), with Terry Ell (General Manager), Pat Banducci (Controller), Michael Galvin (Multi-unit Manager Terminal 4), Joe Campbell (Commissary Manager), and Howard Rudin (Cluster Marketing Manager of Phoenix and San Diego).

We did not want to take on all baked goods for the first project, and so our first job in QFD was to determine what would be best suited for product change. We began this three month journey in May, 1995.

## The bagel project details

### Customer Deployment

Since QFD, like most TQM activities, tries to focus resources on the most important areas, it was useful to determine the key customers we needed to satisfy. The logic here was that if we could meet or exceed the most important expectations of the most important customers, the rest would take care



<b>Fig. 3. Prioritization of project goals.</b>	CS	AS	LL	PI	WR	RAW SCORE	% OF TOTAL
CUSTOMER SATISFACTION (CS)	1	5	10	5	10	31.0	<b>40.5%</b>
ASSOCIATE SATISFACTION (AS)	0.2	1	5	5	10	21.2	<b>27.7%</b>
LANDLORD SATISFACTION (LL)	0.1	0.2	1	0.2	5	6.5	<b>8.5%</b>
PROFIT IMPROVEMENT (PI)	0.2	0.2	5	1	10	16.4	<b>21.4%</b>
WIN & RETAIN CONTRACTS (WR)	0.1	0.1	0.2	0.1	1	1.5	<b>2.0%</b>
TOTALS	1.60	6.50	21.20	11.30	36.00	76.60	100.0%

of itself. The generic model of customer deployment [Mazur 1993a] flows from identifying and prioritizing project success criteria to identifying and prioritizing core competencies to identifying and prioritizing customer segments. Since we were already dealing with strategic competencies, Mazur helped us redefine the customer deployment to fit our situation. Figure 2 is a matrix flow chart of that process and figures 3 and 4 give a portion of the details. The purpose of these matrices was to determine key customers of key unit types (terminal, unit area, etc.), that would sell the targeted baked good, that would lead to the project being deemed successful by management. Once identified, we would target our market research on these customer segments first, thus conserving our research activities to the most fruitful segments.

Our first task was to clearly define how the project would be deemed successful by our management. First we brainstormed and then used an interrelationship digraph (details omitted) to understand the drivers and “resultors” of these goals. We found that customer satisfaction drove many of the other goals and should be the primary focus of the project. Increased sales, profit improvement, landlord satisfaction, associate satisfaction and 15 other goals were identified. With an affinity diagram, they were grouped under 5 headers: customer satisfaction, associate satisfaction, landlord (airport authority) satisfaction, profit, and won and retained sales contracts. Some goals were more important than others, and so a prioritization matrix [Brassard 1989] was used to prioritize them. See Figure 3.

The next step was to augment our traditional baked goods with other potential varieties in order to identify the kinds of baked goods that might lead to customer satisfaction in an airport setting. Following Mazur’s “batman” process of brainstorm, affinity, tree, matrix, a hierarchy of possible baked goods was created. This assured that we had not overlooked any baked goods that could have made an especially exciting offering. See Figure 4 for a portion of the tree.

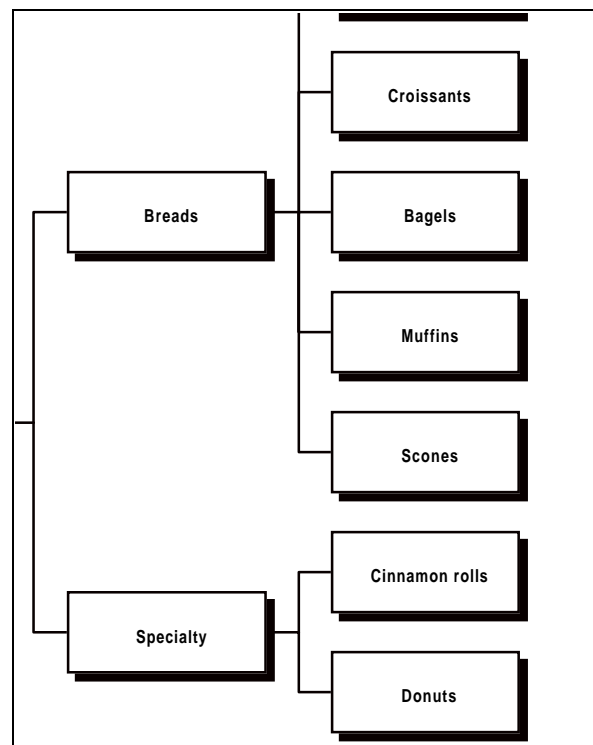


Figure 4. Tree of types of baked goods

The baked goods tree was prioritized in a matrix from the project goals and their priority weights (details omitted). The analysis was to determine which baked goods would contribute most to the success of the project goals. From this bagels were selected.

The next step was to determine the type of retail unit we would sell these in. The batman technique was used to details these and a matrix was created with the highest priority baked goods and the type of unit (details omitted). The unit types included full service restaurant, concourse kiosk with large display cases, kiosks with small display cases, and branded outlets. From this matrix we learned the type of sales unit which would be most successful at selling bagels - the concourse kiosk with large display cases.

The next phase was to identify customer segments based upon use characteristics such as time of day, purpose of coming to airport, etc. This was a change from the usual market research that delivers demographic characteristics, such as income, education, etc. The batman process was applied to organize these into a matrix (details omitted) with the unit type based upon what type of customer was most likely to eat at a concourse kiosk. The highest priority customer segment turned out to be women traveling in the morning on business. We decided to look at both men and women. This is how we selected the gemba. The next step was to go to the gemba and determine the needs of these key customers.

In our traditional approach to going to the gemba in the context of product planning, our attention was on internal issues such as sanitation, staffing levels, product display, etc, rather than on the customer using our products and facilities. Mazur took us on a practice run down to the cafeteria, where the team spent about an hour observing customers enter (or choose not to enter) the cafeteria, look around for menus, inspect the food, take things, put things back, pay, and try to find a table. What we were taught to look for and record were evidence that the customer was able to complete each action easily and pleasurably and to identify

barriers. Especially valuable were smiles and grimaces on the faces of our customers.

What we got was a view we don't normally see in our planning sessions in meeting rooms. Later, at the bagel gemba, there were many usage issues we had not seen before. For example, the packaged cream cheese was difficult to open, plastic utensils broke, there was no place to sit. Careful analysis of this data and interviews revealed that more bagel varieties and flavored cream cheeses were desired. We also noticed that we were selling bagels in a way that focused on speed of service (we wouldn't cut bagels or toast them which we though could hold up the line), so we didn't offer the most popular ways bagels are eaten! Our managers didn't believe customers really wanted a toasted bagel because they never asked for them. Boy, were we wrong!

### **Voice of Customer Deployment**

At the gemba, the spoken words and observed actions of the customer were recorded in the Voice of Customer Tables Part 1 and 2, which record usage data, such as time of day, whether meal or snack, etc. and sort the voices into benefits vs. features, respectively. The benefits, called demanded qualities in QFD, were put through the batman process, and included items such as "I have more choices," "Tastes good," "Easy to carry," etc.

A survey was conducted of bagel eaters at the gemba and about 50 responses were received. Demographics were about 40% men to 60% women, about evenly split between Phoenix residents and those who were not, and were about twice as many pleasure travelers as business travelers. They were asked to prioritize these benefits so that we would know which they valued the most. The survey also asked them to compare the current bagel offered at our airport terminals with those they had elsewhere in terms of each of the benefits. Frequency distributions of responses were incorporated into an analysis that showed us what was most important to customers and where competition was perceived as better. Our mission then became to exceed the competition in those



**Figure 6. Phoenix Bakery Project Function Deployment**  
**QUALITY ATTRIBUTES V. FUNCTIONS**

QUALITY ATTRIBUTES	FUNCTIONS												Q.A. WEIGHTS
	COMM >>>					OPS >>>							
	SOURCE PRODUCT	ACQUIRE PRODUCT	STORE PRODUCT	PREPARE PRODUCT	SHIP PRODUCT	FINISH PREP	SELL PRODUCT	SERVICE CUSTOMER	DISPLAY PRODUCT	MAINTAIN PRODUCT	CLEAN ENVIRON		
VISIBILITY OF OPTIONS	1	3	0	3	3	3	0	0	9	9	9	14	
# OF BAGEL VARIETIES	9	9	3	9	9	1	3	0	9	9	0	11	
# OF TOPPING VARIETIES	9	9	3	9	9	1	3	0	9	9	0	12	
# OF HEATING OPTIONS	9	3	0	0	0	9	1	9	0	0	1	10	
ABSOLUTE WEIGHT	315	280	69	249	249	159	79	94	333	333	136		
QA/FUNCTION WEIGHT	14	12	3	11	11	7	3	4	15	15	6		

matrix deployed the quality attributes and their priority weights from the bottom of the House of Quality to prioritize the most critical business functions for assuring success of the new bagel service. It showed that the commissary, sourcing, acquiring, and shipping of the new products would be critical. At the operations level, displaying and maintaining the attractive appearance of the bagels was identified as critical. See Figure 6. The sourcing people began right away contacting the big bagel vendors and cream cheese producers to learn what the current favorites were. Mazur introduced us to an industrial toaster company, Prince Castle, that had a toaster that could toast the bagel in about the same time as it takes to complete the sale, so there would be no delay of the airline passenger.

**Reliability deployment**

When developing a new service, it is important to assure that any new processes employed are not

failure prone prior to the new service starting up. Comprehensive QFD uses reliability deployment to first identify the potential fail points, and then to eliminate them in the design of the service. Figure 7 is the reliability matrix. The failpoints are prioritized by deploying the demanded qualities from the House of Quality into the reliability matrix. The highest ranking failpoint in this matrix is running out of product.

**New concept deployment**

At this point in the QFD study, we now understood customer preferences and choices, performance targets, key business functions, and potential failures to avoid. This gave us the information to begin developing alternative processes to fulfilling these requirements.

Different display cases, heating equipment, sourcing of bagels and cream cheese were worked into process flows and examined for their ability

**Figure 7. Phoenix Bakery Project Function Deployment**

DEMANDED QUALITIES v. FAILURE MODES (CHILDREN)														
FAILURE MODES >>>>														
DEMANDED QUALITIES	BAGEL'S BURNT	TOPPINGS FALL OFF	WRONG PORTIONS	FAILED QA STDS.	TOUGH BAGEL	RUN OUT OF SERVICEWARE	RUN OUT OF CONDIMENTS	RUN OUT OF PRODUCT	MESSY ENVIRONMT	EQUIPMNT FAILS	RUN OUT OF CLEANG SUPL	IGNORES CUSTOMERS	BAD HYGNE/ DRESS	DEMANDED QUALITY WT.
HAVE MORE CHOICES:														
BAGELS	0	0	0	3	3	0	3	9	0	1	0	3	1	25
TOPPINGS	0	3	3	3	0	3	9	9	9	1	3	1	1	14
PREP. OPTIONS	9	3	1	9	3	3	3	9	3	9	1	3	1	19
SATISFIES MY APPETITE:														
TASTES GOOD	9	1	1	9	9	1	9	9	1	1	0	0	0	19
VISUALLY APPEALING	9	9	3	1	0	0	3	9	9	0	1	1	9	11
PLEASANT AROMA	9	0	0	1	0	0	1	9	3	1	0	0	9	12
ABSOLUTE WEIGHT	549	217	113	482	303	118	474	900	337	353	44	185	265	100
FAILPOINT WEIGHT	13	5	3	11	7	3	11	21	8	8	1	4	6	

What	Who	When	Where	How	How much	Why	Other
cutting bagels	Mike Galvin T-4 associate	by Aug, 28, 1995	in house	test equipment	until comfortable, but no less than 12 bagels	specs for cutting method	failure modes safety speed of service issues
order bagel cutter	Joe Campbell	by Aug. 25	in house	purchase order	at least 3 for each testing unit plus one backup	for start of project in unit	failure modes proper knife knife length
scoops for top- ping portioning	Joe Campbell	by Aug. 25	in house	test order	6 of each for each test unit	different types of toppings, portion control, speed of service	possible equipment other than scoop, break- age

Table 3. Excerpt from task deployment table for Phoenix bakery project.

to meet the requirements. As mentioned before, Mazur introduced us to Prince Castle, a company that uses QFD to develop its commercial kitchen equipment and from their product line, the Excalibur conveyor toaster was selected for its speed and safety. Several bagel sourcing options were considered including having bagels delivered by a local bakery twice a day, baking them at the commissary and delivering them to the concourse kiosks on a pre-set or on a per request basis, and baking them on site. New cutting devices were also explored.

After analyzing the alternative concepts, a par-baked and frozen bagel supplied by Uptown Bagels that can be thawed quickly and baked in the kiosk in six minutes and would allow fresh baked bagels produced to business demands was selected. A mandatory selection of plain, onion, cinnamon raisin, and honey wheat were chosen along with an optional blueberry and flavor of the month. Different cream cheese options were also explored. The selected process called for mixing flavors into a cream cheese that is whipped and blended on premise and then pre-packaged. Mandatory flavors are plain, onion/chive, and garden vegetable with options of strawberry, low fat, and a flavor of the month. Appropriate signage was also developed.

### Task deployment

The best laid plans come to fruition when individuals are made responsible for carrying out specific tasks in a manner that achieves the targets

that were designed and planned in the previous steps. This is what task deployment does. Mazur developed this deployment from the process quality control sheets commonly found in manufacturing. The purpose of task deployment is to assign for each step in the newly developed process, the person responsible, timing, location, equipment, skill or training, performance, and self inspection requirements. When these are met, then the new process is *assured* that it can meet all the requirements specified, and can thus meet the most important customer benefits, which will lead to achieving the goals of the project as defined at the beginning of the QFD. An excerpt of the task deployment tables is given in Table 3.

### Standardization

No project is complete until we can assure the ongoing performance of the new system. Since QFD is a Total Quality Management approach, standards should be created for initial and ongoing training of employees and associates, vendor compliance, etc. After the tests were completed in August, the QFD team began to develop standards that have been compiled in a booklet entitled *Sales Double: QFD Bagel Project - A QFD Approach*. Published by Host Marriott Services at Phoenix, Arizona, this shows the specifications, procedures, policies, equipment, and expected results of this new service. This standard has been adopted by our F&B standards department as the standard for all our generic (non-branded) units that sell bagels. Excerpts are given in Figure 8.

## Sales results

As the title implies, sales in the Phoenix airport concourse kiosks more than doubled as a result of the QFD efforts. Table 4 shows some of the results.

Location	Avg. Daily sales before QFD	Sales 30 days after QFD	Sales 120 days after QFD	% change
Terminal 4 NW	70	133	169	+240%
Terminal 3 Main Snack Bar	40	95	118	+295%

Table 4. Selected results of Phoenix bagel project.

Changes in customer choice data were also tracked. Figure 9 shows for some of the most critical customer benefits how our product was perceived compared to other bagels customers have had. As shown there were dramatic improvements in the key customer benefits of more bagel and cream cheese variety and heating options, as well as other benefits such as tastes good and easy to spread. And we were pleased that the enhanced options actually yielded improvements in service speed, which was contrary to what we initially worried would deteriorate.

## Conclusions

The benefits of QFD were certainly proved in this project. That we were able to achieve two to three times sales growth in only one month and then sustain that over the next six months speaks to the staying power of focusing on the customer and then standardizing the resulting improvements. Through this careful analysis, job responsibilities have been improved and those who are responsible

for the day-to-day operations are involved in the process.

Our next step is to carry this to our San Francisco operations, and to build this process into other future operations (see next section). The time commitment still concerns us in terms of a cost-benefit ratio. By the end of the project, six people had spent fifty-three hours each (a total of 318 hours) on this QFD project. Three issues emerge that affected this.

1. The team was new to QFD and many of its tools. In the future, the 7 Management and Planning tools should be taught first.
2. We wanted to explore the full power of Comprehensive Service QFD in order to judge its applicability to future projects. Thus, some of the steps we took were more for learning purposes.
3. We wanted to involve the corporate TQM department and so the project was stretched out over three months.

Now that we are educated in the process, we intend to review the process steps in order to develop a “down and dirty” approach that can be done by a team dedicating their time off-line, rather than trying to fit it into their regular day.

Mazur has recommended Blitz QFD, a matrix-less approach developed by Mark McDonald of Andersen Consulting and Richard Zultner of ZULTNER & CO. for software QFD and Glenn Mazur for service QFD. It is quick enough that it can be done in a single day, if the team members have assembled the correct data in advance.

In the end, our plan is to develop a standard approach that must be followed in order to change the product specifications of our core products.

## Future activities: Halo Effect

The benefit of going to the gemba to understand the customer’s perspective is being integrated into

our planning process at Phoenix Sky Harbor International Airport. Two projects have been engaged since January. One was the design of a new sandwich deli. Strong customer demands such as “sandwich is made the way I like it,” “sandwich is fresh” and “sandwich is fast,” have been realized with a moving sandwich line where the sandwich is moved from station to station by the attendants who add ingredients chosen by the customer. This has reduced a line back up as well as increased satisfaction by being able to choose what they get. Also, to make it easier for both the attendants to load bottled drinks in the refrigerator and for customers to remove them, the sliding door refrigerator has been replaced by one with an air curtain similar to units in a supermarket. Drink sales jumped almost immediately, and this is now becoming a standard configuration at other Host airport properties in the Southwest.

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QFD is a cross-functional process that enlists the help of many people. I would like to thank foremost, Wayne Eddy and his team at the Phoenix Sky Harbor International Airport for their dedicated work on this project. It was by them and for them that this project succeeded. I would also like to thank the other executives at Host Marriott who took their time to study this process with me. The bagel, cream cheese, and toaster vendors also deserve acknowledgment for sharing their data and for helping with testing of new configurations. Finally, thanks to Glenn Mazur for his guidance and willingness to customize the process on the fly as our needs became clearer through the process, and for his off-site support of our progress via fax and phone.

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## About the authors

**Steve Lampa** is currently Brand Executive with Marriott Hotels, Resorts, and Suites. From 1991 to 1996 he was Vice President of Total Quality Management at Host Marriott, and prior to that spent 16 years in operations and human resources at Marriott Hotels. Lampa earned his Bachelor's Degree in English at Northern Illinois University. He is a Malcolm Baldrige National Quality Award Examiner from 1995-1996.

**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. His primary focus is in the service industry, as a manager for over 15 years in automobile repair and parts warehousing, as a teacher, and as an owner of a translating and consulting business he started in 1982. He is one of North America's leaders in the application of QFD to service industries, sits on several advanced QFD research committees, and sits on the steering committee of the Symposium on Quality Function Deployment held annually in Detroit. He is also Executive Director of the non-profit QFD Institute and an Adjunct Lecturer of Total Quality Management at the University of Michigan College of Engineering. He lectures and trains in QFD worldwide.

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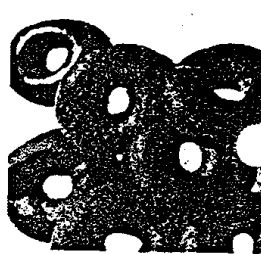
<b>SERVICE PROCEDURES</b>	<b>BAGEL ORDERING</b>
<p><b>Service Procedures:</b></p> <ul style="list-style-type: none"> <li>➤ Greet Customer</li> <li>➤ Ask "how may I help you?"</li> <li>➤ If type of bagel has chosen, offer assistance</li> <li>➤ Use debit</li> <li>➤ "Ask," "No"</li> <li>➤ Place order</li> <li>➤ Ask as to</li> <li>➤ Offer add</li> <li>➤ Place order</li> <li>➤ Place bag</li> <li>➤ Thank you</li> <li>➤ Thank you</li> </ul> <p><b>FOOTNOTES:</b></p> <ul style="list-style-type: none"> <li>• If any time is</li> <li>Without flour</li> </ul>	<p><b>BAGEL ORDERING</b></p> <p><b>Bagel Orderline:</b></p> <ul style="list-style-type: none"> <li>➤ Bagel order is entered by the exact amount has freezer storage capacity</li> <li>➤ Bagels may through to</li> <li>➤ Bagel is for</li> <li>➤ Year on to increase (Order Up)</li> </ul> <p><b>BAGEL SPECIFICATIONS</b></p> <p><b>Bagel Types: Opened Bagels</b></p> <ul style="list-style-type: none"> <li>➤ Bagel is pre-baked and frozen</li> <li>➤ Bagel Thaws quickly and oven ready</li> <li>➤ Bagel takes 6 minutes to finish in oven</li> <li>➤ Bagel is HOT</li> <li>➤ Bagel always</li> <li>➤ Bagel has a on</li> <li>➤ Bagel is out of</li> </ul> <p><b>Bagel Assortment: Alltime</b></p> <ul style="list-style-type: none"> <li>➤ Mandarine P and Honey W</li> <li>➤ Additional Bl</li> </ul>
<p><b>DISPLAY SPECIFICATIONS</b></p> <p><b>Display:</b></p> <ul style="list-style-type: none"> <li>➤ Bagel requirement is at least 90% of display case or bakery sales area</li> <li>➤ Bagels must maintain a level of no less than 8 of each type during "selling period."</li> <li>➤ Bagels may be stored on trays, in baskets or in a small case</li> </ul> <p><b>Cream Cheese</b></p> <ul style="list-style-type: none"> <li>➤ Cream cheese display area</li> <li>➤ Cream cheese of under 40</li> <li>➤ Bagels and (to customer)</li> <li>➤ Bagel price (cream cheese)</li> <li>➤ Allow flour as cream cheese</li> <li>➤ <b>FOOT NOTE:</b> 1 bagel for a full If at any time it is imperative</li> </ul> <p><b>Bagel shelf life:</b></p> <ul style="list-style-type: none"> <li>➤ Freezer: 6 months</li> <li>➤ Refrigerator (un-finished bakes), 1 day</li> <li>➤ Finished bakes: <ul style="list-style-type: none"> <li>• 4 hours in a dry display case</li> <li>• 6 hours in a sealed plastic bag</li> <li>• 8 hours wrapped in plastic bag</li> </ul> </li> </ul> <p><b>Cream Cheese:</b></p> <ul style="list-style-type: none"> <li>➤ Stored in</li> <li>➤ Stored in</li> <li>• FOOT NOT</li> </ul>	<p><b>BAGEL AND CREAM CHEESE SHELF LIFE</b></p> <p><b>Bagel shelf life:</b></p> <ul style="list-style-type: none"> <li>➤ Freezer: 6 months</li> <li>➤ Refrigerator (un-finished bakes), 1 day</li> <li>➤ Finished bakes: <ul style="list-style-type: none"> <li>• 4 hours in a dry display case</li> <li>• 6 hours in a sealed plastic bag</li> <li>• 8 hours wrapped in plastic bag</li> </ul> </li> </ul> <p><b>Cream Cheese:</b></p> <ul style="list-style-type: none"> <li>➤ Stored in</li> <li>➤ Stored in</li> <li>• FOOT NOT</li> </ul>
	<p><b>TABLE OF CONTENTS</b></p> <ul style="list-style-type: none"> <li>➤ Bagel specifications Page 1</li> <li>➤ Cream cheese specifications Page 2</li> <li>➤ Bagel ordering Page 3</li> <li>➤ Cream cheese ordering Page 4</li> <li>➤ Shelf life Page 5</li> <li>➤ Display specifications Page 6</li> <li>➤ Bagel cutting Page 7</li> <li>➤ Cream cheese portioning Page 8</li> <li>➤ Service procedures Page 9</li> <li>➤ Baking procedures Page 10</li> <li>➤ Marketing Page 11</li> <li>➤ Toaster information Page 12</li> <li>➤ Bagel Statistics Page 13</li> <li>➤ Bagel color reference chart Page 14</li> </ul>
	<p><b>"SALES DOUBLE" OFD BAGEL PROJECT</b></p> 

Fig. 11 Excerpts from Phoenix Bakery Bagel Project Standards Manual.

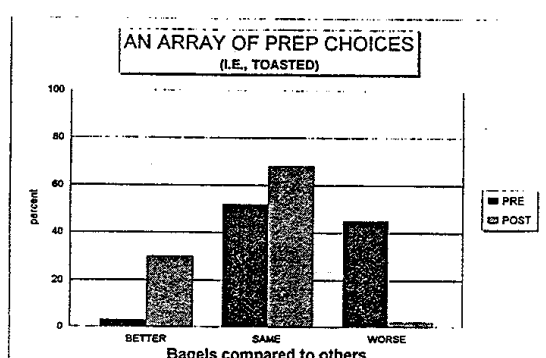
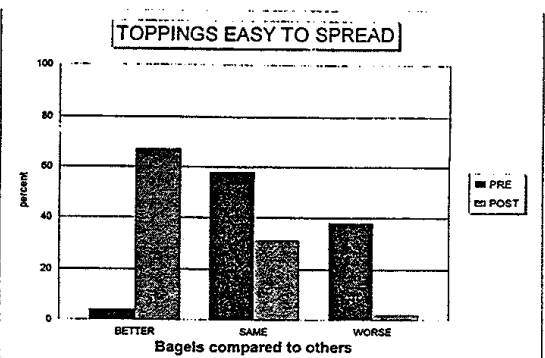
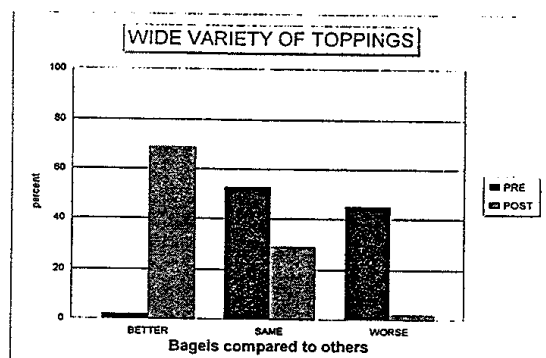
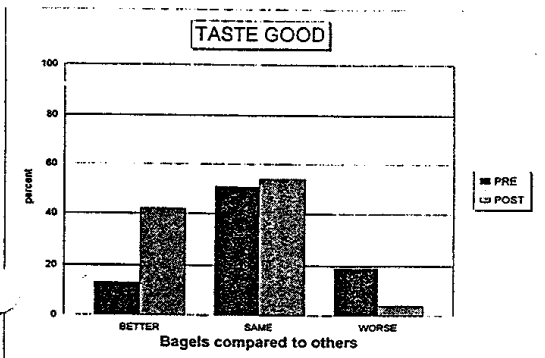
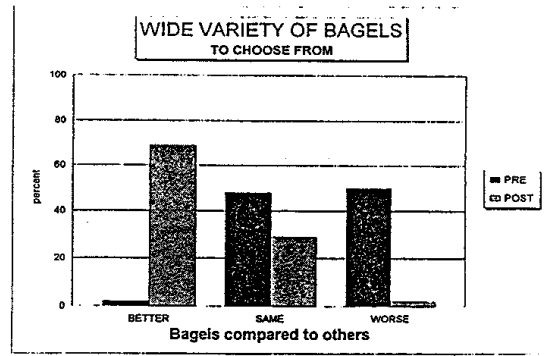
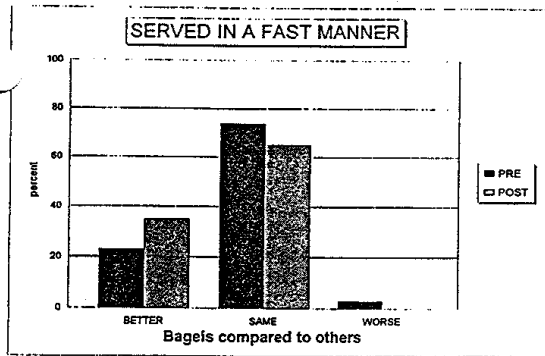


Fig. 12 Improvements in customer benefits.