
QFD Application in the Hospitality Industry: A Hotel Case Study

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Quality function deployment (QFD) is a methodology for capturing and translating the voice of the customer (VOC) into engineering characteristics of products or services. In addition, the process prioritizes and deploys these customer-driven characteristics throughout the product or service development to meet the VOC (that is, customer needs, wants, and expectations). QFD determines effective development targets for the prioritized product and service characteristics. The QFD process has been used and documented extensively in product development. The service industry, however, lacks in the application of this process. The purpose of this paper is to show practitioners and researchers how this process, in its entirety, can be used as a planning process to link customer requirements and service characteristics in the hospitality industry. A case study was developed focusing on a specific hotel to illustrate the application of the QFD process in a five-star hotel.

Key words: four-phase QFD, hospitality industry, quality function deployment, service, SERVQUAL, total quality management

INTRODUCTION

The service industry exhibits distinct features that are not shared in the manufacturing industry. Many service organizations are profit-earning business enterprises such as hotels, restaurants, and retail stores (Yang 2005). The hotel and hospitality industry is often perceived as the most “global” in the service sector (Mace 1995; Littlejohn 1997). Hence, substantial capital is invested in designing and improving hotels each year. On the other hand, a key challenge for management is achieving customer satisfaction in an increasingly competitive marketplace. Therefore, the hospitality industry, and hotels in particular, have witnessed increasing competition for high service quality and customer satisfaction. This is because the majority of hotels are currently implementing corporate-wide quality management programs designed to improve service offerings and market retention. Interest in service quality has increased in recent years, with a growing literature relating to the application of total quality management (TQM) concepts in the service industry, especially in the hotel industry. There are many classic cases that have applied quality management methodologies in this industry. For example, the Ritz-Carlton Hotel’s TQM program has been widely recognized as a quality leadership program (Partlow 1993). This led to the hotel winning the Malcolm Baldrige National Quality Award in 1992 and 1999. In addition, the Sheraton Hotel recently initiated its Guest Satisfaction System to enhance its customers’

lodging experience and boost its return rates (Miyoung and Haemoon 1998). As another illustration, Carlson Hotels in the Asia Pacific have been acknowledged for excellence in service standards and operations supported by outstanding performance in the areas of revenue generated per available room, customer satisfaction, employee engagement, and quality assurance standards.

Quality function deployment (QFD) is a systematic planning process used by cross-functional teams to identify and resolve the issues involved in providing products, processes, services, and strategies that enhance customer satisfaction (Gonzalez, Quesada, and Bahill 2003). With the application of the QFD process, possible relationships are explored between quality characteristics expressed by customers and substitute quality requirements expressed in engineering terms (Cohen 1995; Clausing 1994). The question raised by service industry practitioners is whether the QFD process can be applied to the service industry. The answer, as this paper demonstrates, is a resounding “yes.” It is the authors’ intent to show practitioners and researchers how the QFD process can be used as a planning process to link customer requirements and service characteristics in a hotel. The QFD process originally initiated in product development, but it is definitely a suitable means to support the development of a wide range of services. In contrast to the classic QFD process for product development, the specific characteristics of services must be taken into account when applying the QFD process to service development. This process can be viewed as a planning road map that aids the development team in decisions that must be made during each step, and what information is needed to make those decisions (Cohen 1995). This paper aims at proposing a structured approach, based on the QFD process, to a hotel with a focus on both external customer needs and internal service management requirements. The primary objectives of this paper are to:

1. Outline the QFD process as it applies to a hotel
2. Illustrate the mechanics of the QFD process using a hotel as a case study

Literature Review of the Use of QFD in the Hotel and Hospitality Industry

Initiated by Shigeru Mizuno and Yoji Akao of the Tokyo Institute of Technology in the 1960s, the QFD process was first applied at Mitsubishi Heavy Industries Limited in the Kobe Shipyard, Japan, in 1972. In the early 1980s, QFD became popular in North America, starting with companies such as General Motors, Ford, and Xerox. Since then it has been successfully applied in manufacturing and service industries by many organizations. The QFD process is a customer-focused quality management and product development methodology that was used originally for tangible products, but its ideas also are applicable to services. QFD was gradually introduced into the service sector to design and develop quality services (Chan and Wu 2002). More than three decades have passed since Japanese academics and industrialists began to formalize the QFD process due to its effectiveness in product development and quality management. Since then many QFD process applications and studies have been reported. Despite adaptations of the original process to services, service applications of the QFD process remain limited. Although there are more than 1000 documented case studies on QFD process in Japan alone (Akao 1997), Mazur (1997) reports only 136 documented applications worldwide for services. Moreover, of these 136 applications, the frequency of reports by year peaked in 1993 and has remained stable, if not declined, since.

The hospitality industry, hotels included, employs thousands of people and generates high revenues annually in value-added services. Thus, any quality improvement in this industry will have a significant effect on costs and market competitiveness (Oke et al. 2008). In spite of this, the literature regarding the application of the QFD process in hotels, in particular, or the hospitality industry, is limited. The few existing examples refer to the same publications and are limited to only a general description of

Table 1 Total cost of quality matrix.

Reference (Authors)	Approach	More matrices used?	Notes
Miyoung and Haemoon (1998)	Develop a hypothetical QFD application in the lodging industry in order to illustrate future application and analysis strategies through a tentative example	No (Only show the HoQ)	–
Oke et al. (2008)	The combined application of QFD and Pareto Analysis (PA) to hotel services through a case-study hotel	No (Only show the HoQ)	Used Kano classification of customer attributes
Kirk and Galanty (1994)	QFD method for customers requesting a guest room	No (Only show the HoQ)	Used Pugh Concept selection process in defining variables for various alternatives
Dube, Johnson, and Renaghan (1999)	A modified QFD approach for extended-service transactions and empirical demonstration with luxury business hotels	No (Integrating higher-order consumer needs in the VOC deployment and using VOC information beyond the HoQ)	–
Stuart and Tax (1996)	Identify the potential of the QFD process through the HoQ as an effective tool both for the strategic service positioning level and for the service quality delivery planning process at the tactical level. Use the front-desk activities in a hotel as an illustrative example of the QFD planning process	Three-phased QFD (modified for service environment)	–

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how the QFD process might be applied. Their main theme is on the first phase of the QFD process, the house of quality (HoQ). In some cases, the authors have extended their analyses to an additional matrix in which performance measures from the HoQ matrix are deployed and assessed against features of a product or service. In a few cases, the studies have accomplished further analyses. In Japan, where the QFD process originated, the majority of its applications stop with the HoQ (Cohen 1995). The four-phase QFD process application or adaptations are very limited. Table 1 summarizes the QFD process applications in the service industry. In this paper, the conventional four-phase, manufacturing-based QFD process has been modified slightly to apply it to the hotel business.

THE QFD FLOWDOWN PROCESS

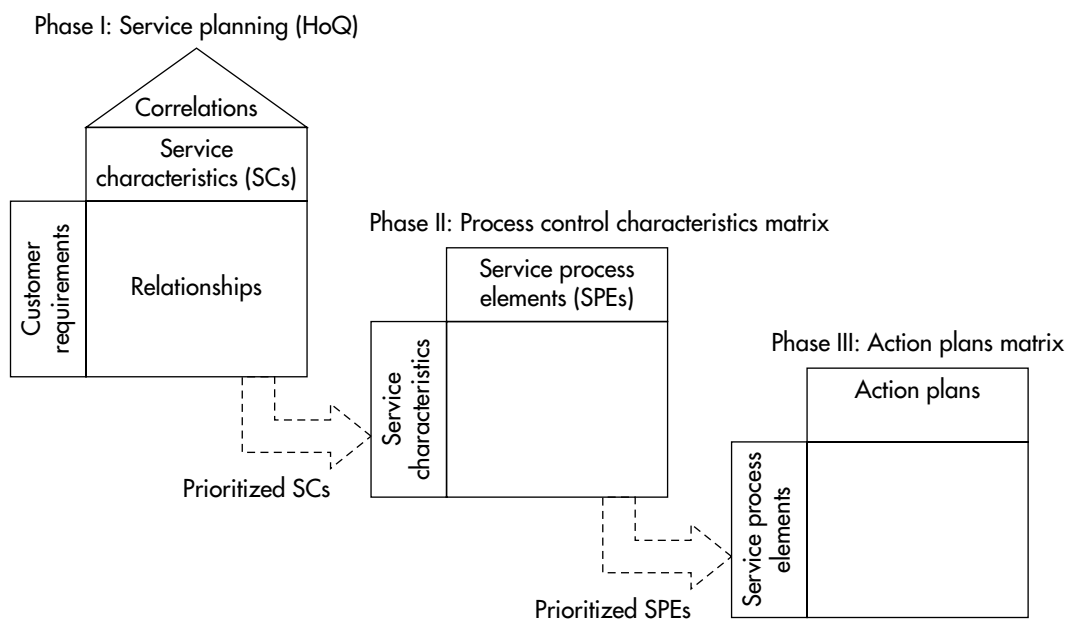
QFD is a process for capturing and translating customer requirements into company requirements at each stage, from research and product or service development to engineering and manufacturing

to marketing/sales and services (Jikar et al. 2007). Akao (1990) defines the QFD process as a method for determining design qualities that are aligned with customer expectations, and then translating the customer requirements into design targets and critical quality assurance points that can be used throughout production or service development. QFD has been extended for application in any planning process where a team wants to systematically prioritize its possible solutions to a given set of objectives (Urban and Hauser 1993). Gonzalez (2001) states that QFD has two fundamental purposes:

1. To improve the communication of customer requirements throughout the company
2. To improve the completeness of specifications and to make the specifications directly traceable to customer requirements and needs

In recent years, QFD has received more attention because of its perceived benefits and its fundamental role in the Six Sigma and Design for Six Sigma methodologies. The major benefits of applying QFD are (Benner et al. 2003):

Figure 1 A three-phase action plan based QFD flowdown process in the hospitality industry.



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- To help companies make key trade-offs between what the customer demands and what the company can afford to produce
- To bring together all the data required for the development of a product or service
- To assist the development team in quickly identifying where additional information is needed during the process
- To shorten time to market

The most-used QFD methodology beyond the HoQ is the conventional manufacturing-based QFD, which is deployed through a four-phased sequence (Sullivan 1986). The four phases are:

- Phase I: Product planning (HoQ)
- Phase II: Design deployment (part deployment)
- Phase III: Manufacturing planning (process planning)
- Phase IV: Production planning (production operations planning)

In this research, the four-phase-based QFD was modified, due to the fact that there is no part deployment in the service application, into a three-phase

action plan based methodology. Conceptually, the entire QFD flowdown process, as applied in this research, is shown in Figure 1. Each phase's purpose will be discussed in later sections. The three-phase QFD flowdown process includes:

Phase I: Service planning (HoQ).

The overall process of QFD is based on its core matrix framework, called the HoQ. The components of this house are:

- Understanding and identifying the target customers
- Identifying customer requirements (WHATs)
- Establishing relative importance of customer requirements (AHP-driven importance rating)
- Analyzing the customer requirements (WHATs)
- Performing a customer competitive evaluation and analysis
- Identifying service characteristics (HOWs)
- Establishing relationships between the WHATs and HOWs
- Prioritizing service characteristics and technical weightings

- Establishing the correlations matrix
- Performing a technical competitive assessment
- Setting desired target values to achieve customer satisfaction
- Analyzing the HoQ

The prioritized service characteristics are transformed to the next phase.

Phase II: Process control characteristics matrix.

This phase links the service characteristics identified in Phase I to the service process elements that will satisfy the customer requirements. In this phase, the measurable or quantifiable characteristics will be defined for each service characteristic and prioritized from the HoQ to develop the process control characteristics matrix. This matrix will include service process characteristics, measurement units, measurement scales, and target values. Some of these characteristics are application dependent.

Phase III: Action plans matrix.

This phase links the service process elements to the service quality control parameters that need to be monitored to ensure customer satisfaction. An action plan is developed for each of the critical process characteristics that are identified in Phase II. All the action plans will result in an Action Plans Matrix. All action plans will be measurable to allow maintaining control of critical service characteristics and consequently attaining customer satisfaction goals (that is, target values). The following section explains in detail how the three phases were developed.

Research Methodology Through a Hotel Case Study

Azadi Grand Hotel, formerly Hyatt Hotel, with a 24-story high tower on a two-story podium (ground and mezzanine) and two basement levels, is the most famous five-star hotel in the metropolitan area of Tehran, Iran. It is located at the skirt of the

Alborz mountains range, away from the crowded city center, providing an ideal residence for business visitors and diplomats to the capital city. The hotel was built in 1976 by the Hyatt chain and was managed by that chain until the revolution in Iran in 1978. The majority of the hotel's guests are business people and diplomats, and the average occupancy rate (Occ. %) is approximately 60 percent, of which 45 percent are business people, 12 percent are diplomats, and 3 percent are normal guests. The Azadi Grand Hotel executives decided to renovate the hotel and its services to make it comparable to the level of quality expected from a five-star hotel. The executives thought that all aspects of the hotel should be analyzed to ensure compliance with current five-star international standards. Hence, they chose a cross-functional team to identify and analyze the hotel functions and service delivery processes. The QFD flowdown process was applied in this hotel, which will be discussed step by step in the following sections.

PHASE I: SERVICE PLANNING (HOQ)

Understanding and Identifying the Target Customers for the Hotel

Globalization has created fierce competition among hotels as major providers of services within the hospitality industry. The long-term survival of a hotel firm in such an increasingly competitive environment depends on its ability to satisfy customers' demands efficiently and effectively (Nicholls and Roslow 1989). The adoption of a market orientation can help a hotel design and offer a service mix that is perceived by its core customers as being of superior quality, while making a profit and building a competitive edge. However, in comparison with other commercial service sectors such as banking, insurance, or retail distribution, the hotel industry

has been slow to adopt marketing as a management discipline (Calantone and Mazanec 1991). Before gathering the VOC, the team needed to identify and understand the hotel's target customers. Since this establishment is a business and diplomatic hotel, it is easy to identify its key customers. Of the two categories of customers, business people and diplomats, access to the diplomat guests was not possible for this research. Consequently, this research targeted business people. The selected sample subjects from the target population of this study were all business travelers who stayed in the hotel during the data collection period.

Identifying Customer Requirements (WHATs)

The HoQ starts with the customers' needs and wants, which are called *customer requirements*. This research used SERVQUAL's structure for identifying the key customer requirements of the hotel and hospitality industry. SERVQUAL's scale, developed by Parasuraman, Zeithaml, and Berry (1985), is a survey instrument that measures service quality on five dimensions including tangibles, reliability, assurance, responsiveness, and empathy. These dimensions represent how customers perceive service quality. Parasuraman, Zeithaml, and Berry (1988) provided evidence of validity by measuring the agreement between the SERVQUAL score and a question that asked customers to rate and classify the overall quality of the company being judged. In addition, whether the respondent would recommend the company to another customer was measured. Miyoung and Haemoon (1998) used SERVQUAL in the HoQ design to measure customer satisfaction of service quality. Despite the wide usage of SERVQUAL by academics and practicing managers in various services industries, it must be modified based on the customers' needs, that is, customized according to the expectations of the guests. Parasuraman, Zeithaml, and Berry (1988) suggest that an adaptation of their scale may be desirable

when a particular service is investigated. Hence, the authors modified SERVQUAL's dimensions to fit their needs. This resulted in the following definitions:

- **Tangibles:** Physical aspects of the hotel services, including the appearance of physical facilities, equipment, personnel, and communication services
- **Reliability:** Ability to perform the promised hotel services dependably and accurately
- **Responsiveness:** Willingness to serve hotel customers in providing prompt service
- **Assurance:** Knowledge and courtesy of the hotel's staff and their ability to inspire trust and confidence in their guests
- **Empathy:** Caring and individualized attention that the hotel must pay to its guests

In this research, the hotel guest interviews determined that the SERVQUAL items were applicable and understandable; however, the dimensions needed modifications for this industry. For example, an original tangible item: "Materials are visually appealing," which was thought to be confusing because of the unclear meaning of "appealing," was replaced by "Hotel's equipment and facilities appear clean and shiny." Finally, by omitting or modifying some of the SERVQUAL items based on the guests' feedback during the interviews, 22 customer requirements were developed using the hotel guests' own words. These requirements are captured in Table 2.

Relative Importance of the Customer Requirements (AHP-Driven Importance Rating)

Yan, Khoo, and Chen (2005) noted that QFD can support the process from problem identification to design specification. In dealing with decision requirements, Saaty (1980) recommends

Table 2 Analyzing the customer requirements.

Customer requirements			AHP-driven importance rating	Case hotel performance	Istanbul hotel performance	Dubai hotel performance	Sales point	Performance goal	Improvement ratio	Raw weight
Reliability	Hotel services are provided as promised	1	0.066	4.00	4.00	4.00	1.20	4.00	1.00	0.079
	Hotel equipment is always functioning	2	0.170	4.00	5.00	5.00	1.50	5.00	1.25	0.318
Responsiveness	Hotel services are provided when promised	3	0.051	4.00	5.00	4.00	1.20	4.00	1.00	0.061
	Hotel staff are always willing to help the guests	4	0.050	5.00	5.00	5.00	1.20	5.00	1.00	0.060
	Hotel staff always respond to guests' requests	5	0.051	5.00	5.00	5.00	1.20	5.00	1.00	0.061
Assurance	Guests feel safe as services are delivered to their room	6	0.024	4.00	4.00	4.00	1.20	4.00	1.00	0.028
	Guests feel safe and secure while staying in the hotel	7	0.026	4.00	5.00	5.00	1.50	5.00	1.25	0.048
	Hotel staff are polite and courteous	8	0.022	5.00	5.00	5.00	1.20	5.00	1.00	0.026
	Hotel staff are knowledgeable to answer guests	9	0.025	3.00	4.00	5.00	1.20	4.00	1.33	0.040
	Guests feel that the hotel services are provided at a competitive and affordable price	10	0.018	4.00	5.00	5.00	1.50	5.00	1.25	0.033
	Hotel staff have the proper skill to perform requested services	11	0.016	4.00	5.00	4.00	1.20	4.00	1.00	0.019
Empathy	Guests receive individual attention	12	0.041	5.00	5.00	5.00	1.20	5.00	1.00	0.049
	Hotel staff take guests' best interest at heart	13	0.037	5.00	5.00	5.00	1.20	5.00	1.00	0.044
	Hotel staff pay attention to guests' specific needs	14	0.044	5.00	5.00	5.00	1.20	5.00	1.00	0.053
Tangibles	Hotel has good-looking furniture, soft furnishings, and fittings	15	0.050	3.00	5.00	5.00	1.50	5.00	1.67	0.125
	Hotel has comfortable beds, furniture, and fittings	16	0.052	3.00	5.00	5.00	1.50	5.00	1.67	0.130
	Hotel's equipment and facilities appear clean and shiny	17	0.046	3.00	5.00	5.00	1.20	4.00	1.33	0.074
	Everything in the room works and is easy to use	18	0.048	4.00	5.00	5.00	1.50	5.00	1.25	0.090
	Hotel has a well-dressed staff	19	0.042	4.00	5.00	4.00	1.50	5.00	1.25	0.078
	Hotel has sufficient facilities for communication and doing business	20	0.043	4.00	4.00	5.00	1.20	4.00	1.00	0.052
	Hotel rooms are equipped with state-of-art entertainment devices	21	0.042	3.00	5.00	5.00	1.00	4.00	1.33	0.056
	Hotel ambience is attractive and has variety	22	0.037	3.00	5.00	5.00	1.20	5.00	1.67	0.074

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that designers apply an analytic hierarchy process (AHP) to determine the ratio-scale weights for importance ratings of requirements. Therefore, a structured AHP questionnaire using modified SERQUAL items was developed, which enabled the guests to make pair-wise comparisons between the customer requirements. To capture the true customer voices, the QFD process requires “going to the gembu” (that is, rolling up one’s sleeves and getting in the field where the customers are). Hotel guests were interviewed, which involved a short meeting with the guests before they filled out the forms to ensure they all had the same understanding about the requirements. Thirty-five hotel guests were asked to assign a weight (an integer between 1 and 9) to the requirements to reflect the importance of a requirement relative to the others. If the second requirement was considered more important than the first one, then the inverse of the weight would be assigned. In addition, intermediate numbers were used if they more accurately reflected the decision of the guest. The answers of the hotel guests were determined to be consistent compared with the consistency ratio of 25 percent. Since this level is acceptable, the geometric mean was calculated for the consistent answers in each cell of the pair-wise matrix of the customer requirements. Then the AHP procedure was applied to reach customer importance levels for each requirement. Table 2 summarizes the AHP-driven importance ratings for the requirements. It is important to mention that the derivation of the characteristics priorities requires ratio scale numbers that necessitate the use of AHP. Most QFD applications do not use AHP to derive customer importance ratings and, therefore, the calculation of the characteristics priorities is mathematically incorrect.

Analyzing the Customer Requirements (WHATs)

According to the budget and hotel leaders’ perspectives and strategies, the level of desired performance

goal and sales point were assigned. In the performance goal column of Table 2, the hotel leaders determined the level of customer performance to target for each customer need. Setting the performance goal is a crucial strategic step in QFD (Cohen 1995). The performance goals are expressed in the same numerical scale as the performance levels. The performance goal, combined with the current rating, is used to set the improvement ratio. The improvement ratio is one of the most important multipliers of importance to the customer. In addition, the sales point column contains information characterizing the ability to sell the service based on how well each customer need is met. The values assigned for sales point are 1 for “no sales point,” 1.2 for “medium sales point,” and 1.5 for “strong sales point.” The overall relative weights for each customer requirement were then determined. This information aids in determining what actions must be taken to improve the hotel guests’ ratings in the different customer requirement areas. As shown in Table 2, there is a difference between the importance assigned by the customer (AHP-driven importance rating) and the importance assigned after analyzing different criteria in the matrix (overall importance). For example, “Hotel equipment is always functioning,” “Hotel services are provided as promised,” and “Hotel has comfortable beds, furniture, and fittings” are the voices rated the highest in importance by the customers. When the importance was assigned by the customer, the sales point, performance goal, and improvement ratio are combined. Then the highest voices in overall importance are “Hotel equipment is always functioning,” “Hotel has comfortable beds, furniture, and fittings,” and “Hotel has good-looking furniture, soft furnishings, and fittings.” In this case, the sales point for these requirements is not the same; therefore, the difference is determined by using the AHP-driven importance rating, sales point, and improvement ratio. For the voice “Hotel services are provided as promised,” the improvement ratio is less than the other two highly rated requirements, namely, “Hotel equipment is always

functioning” and “Hotel has comfortable beds, furniture, and fittings.” This indicates that the hotel must dedicate more effort to these two customer requirements than to “Hotel services are provided as promised.” This is because the difference between the future desired target value and the current value is not as high as in the other two requirements. Based on the overall importance, “Hotel equipment is always functioning,” “Hotel has comfortable beds, furniture, and fittings,” and “Hotel has good-looking furniture, soft furnishings, and fittings” are the most critical customer requirements.

Customer Competitive Evaluation and Analysis

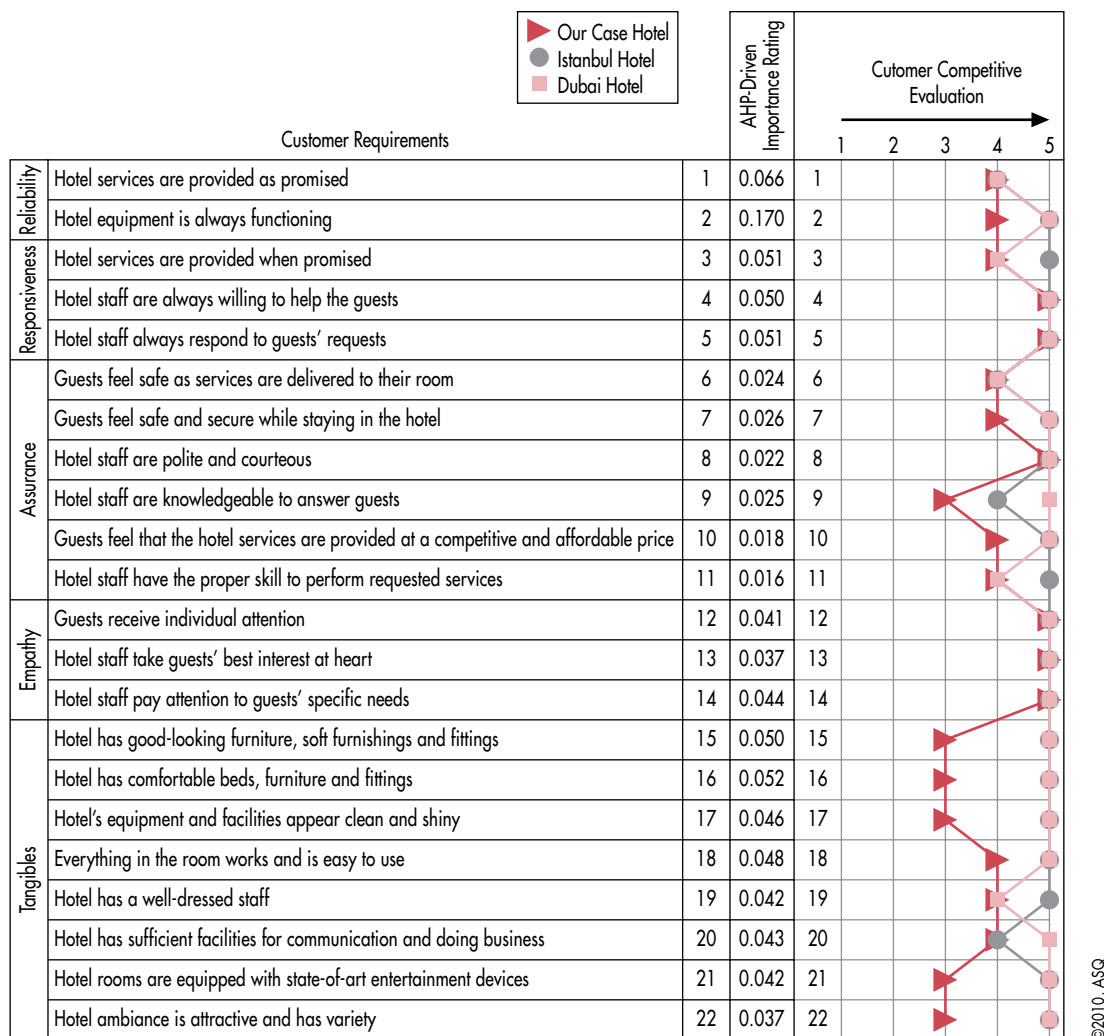
Customer competitive evaluation can identify opportunities for improvement. To evaluate performance and competitiveness, the guests were asked to assess the same hotel chain in Istanbul, Turkey, and Dubai, UAE, in comparison with the five-star hotel performance in this case. Although the competitors were not literally located in Tehran, the guests who were interviewed had previously stayed at the same chain hotels in Istanbul and Dubai on their business travels and knew the services they had received during their stays in those hotels. Therefore, the hotel managers and the team used this comparison with these international competitors as surrogates for a competitive evaluation. In addition, these hotels were selected due to the availability and ease of gathering the necessary data. As shown in Figure 2, the case study hotel must improve service performance in all customer requirements, because the two competitor hotels have higher customer ratings. Specifically, the assigned numbers indicated that the same hotel chains in Istanbul and Dubai were rated better than the case hotel in assurance and empathy dimensions. In terms of tangibles, the same hotel chain in Dubai was rated better than the case hotel and the hotel in Istanbul. The right-most column

in the HoQ graphically displays the performance of this hotel with respect to its competitors. As can be seen in Figure 2, the improvement factor in all customer requirements is equal to or greater than one. Therefore, corrective actions must be taken for all customer requirements to achieve and maintain the level of satisfaction and importance demanded by the hotel guests.

Identifying Service Characteristics (HOWs)

In this stage, the service characteristics are developed. The key question in this step is “how,” in a measurable sense, the hotel would be able to deliver the required services to its guests. For a production firm, it is easier to define these technical requirements based on the company’s operational or managerial resource allocation plans. Miyoung and Haemoon (1998) considered hotel processes in their HoQ, but did not include the human factors and tangible representation of the hotel. In this research, “hotel processes,” “hotel staff,” and “hotel system/environment” are used to define the service characteristics at an aggregate level. These requirements were then modified based on the hotel and hospitality expert opinions. The more specific the characteristics, the easier it is to measure them. That is, when characteristics are aggregated, their true impact is confounded, and it is very difficult to discern the difference between each dimension. Among these service characteristics, there are some statutory obligations where, in some cases such as food and water safety/hygiene and financial fraud, the relevant standard of quality must be met in a five-star hotel. The hotel provides healthy and pure water suitable for drinking and also an extensive choice of nourishing foods in the restaurant and room services. In addition, the hotel provides tight security against credit card fraud in the hotel. Also, there is potential fraud at ATM machines. In fact, the hotel accepts full responsibility over the safety and security of aforementioned cases in the hotel. Besides

Figure 2 Customer competitive evaluation and analysis.



these statutory obligations, the hotel has high-class shopping centers on the lobby and mezzanine floors. Once all these service characteristics met the guests' satisfaction levels, the hotel managers and the team decided not to deploy these service characteristics to the next phases.

From the perspective of QFD, the customer requirements from the HoQ must be translated to measurable/quantifiable characteristics. In this case, three measurement units are employed for service characteristics: quantitative units (measured on a numerical scale), qualitative units (measured on an interval scale), and qualitative units (or attributes

measured on a category scale such as "yes" or "no"). For both quantitative units and qualitative units, a five-point measurement scale for each service characteristic was developed. For instance, the "promptness of check-out" service characteristic is measured in time (minutes) with the scales of 15 minutes, 12 minutes, 10 minutes, 8 minutes, and 5 minutes. The "staff appearance" service characteristic is measured on an interval scale with the scales of unattractive, somewhat attractive, attractive, very attractive, and impressively attractive. Finally, the "style of room equipment" service characteristic is measured on a binary scale of "yes or no," as

judged with respect to attractive style. Moreover, the “blueprinting” concept that is used in operations management was applied. The idea behind blueprinting is to reinforce that services need to be carefully designed as a physical product and documented with a blueprint of its own. This technique illustrates the virtual separation of the aspects that are transparent to the customer (that is, front desk activities) and those that are not (that is, back office activities) using the “line of visibility.” Above the line of visibility reside those characteristics that are visible to and experienced directly by the customers. Below this line are those characteristics that are not visible to and are not directly experienced by the customers; however, they would have an impact on the characteristics that affect customer satisfaction. For example, the service characteristics below the line of visibility are “IT & automation system,” “customer surveys,” “material inventory,” and “monitoring system for reporting of broken/damaged items in need of replacement/repair.”

Establishing Relationships Between the WHATs and HOWs

In this stage, the relationships between customer requirements and service characteristics were determined based on the hotel experts’ judgment obtained from the hotel leaders and employees. The key question in this step is “if we improve the performance of a given service characteristic to improve customer satisfaction, how strongly will this change our characteristic performance to reduce the gap that exists between our service level and our competitor’s for a corresponding voice that is related to that characteristic.” For this, a cross-functional team was formed composed of people representing different hotel divisions such as front desk, reception desk, housekeeping, food and beverage, hotel architecture and design, marketing, and hotel manager. The team agreed on assigning a weight for the relationship between each “WHAT” and each corresponding “HOW,” using 9 for strong, 3 for moderate, and 1 for

a weak relationship. In the HoQ, these weightings are recorded with symbols: H for strong, M for moderate, and L for weak. Because several customer requirements rows in the HoQ were almost completely filled, it would indicate a customer requirement that involves cost, reliability, or safety issues. In particular, these voices are “Hotel services are provided as promised,” “Guests receive individual attention,” “Hotel staff take guests’ best interest at heart,” and “Hotel staff pay attention to guests’ specific needs.” On the other hand, other rows show few relationships, which indicates customer requirements that impact only a few service characteristics. These include “Hotel has comfortable beds, furniture, and fittings,” “Hotel has well-dressed staff,” and “Hotel ambiance is attractive and has variety.”

Priorities of Service Characteristics and Technical Weightings

The coarse importance and relative weight of service characteristics are determined using the relative importance values and the relationship matrix developed in the previous step. The accuracy of the results in this step relies heavily on the quality of the relationship matrix. The coarse importance weight of each service characteristic is calculated by summing the products of the relationship strength (that is, the cell value assigned in the relationship matrix) and the relative weight of the customer requirement (that is, AHP-driven importance rating). This computation process combines the customer requirements with the service characteristics, so the resulting value gives the relative weight of each service characteristic as compared to the customer requirements. According to the relative weights, “problems resolution,” “satellite TV,” “staff friendly behavior,” “phone (long distance and international line accessibility),” and “radio” have a greater priority over the other service characteristics that should be deployed for further development in the second phase.

Establishing Technical Correlations Matrix

This step is for management to determine the degree of the functional relationship for each pair of service characteristics. Most important, the correlation matrix brings in a systems thinking perspective. If the decision is made to improve an aspect of the service, then the decision must be assessed as to how that change is going to impact other areas, in particular, if the impact is negative or degrading. The trade-offs were defined through the use of symbols in the HoQ and assigned “+” for synergy and “-” for a compromising functional relationship. To improve “problems resolution,” improvements to “staff friendly behavior,” “training & education,” and “motivation” may be necessary. The negative relationships for the “price” characteristic affect “porters availability,” “staff appearance,” “training & education,” and “proprietor & staff are on site and on call.” Any design concept may have a number of conflicts. A good design concept is the one that has no or minimal conflicts. The analysis of these conflicts is performed through the correlation matrix.

Technical Competitive Assessment

This is the process of examining the competition’s product or service according to specified standards and comparing it to one’s own product or service with the objective of deciding how to improve one’s product or service (Cohen 1995). In this case, the authors compared the case hotel’s performance with the same hotel chain in Istanbul and Dubai. The values assigned for this comparison were on a five-point scale ranging from 1 for poor to 5 for good. The case hotel performance, except for a few service characteristics such as “staff courtesy” or “style of service/food presentation” is lower than its competitor’s performance, especially in the “satellite TV” and “assorted foods and cuisine” characteristics.

Setting Desired Target Values to Achieve Customer Satisfaction

After prioritizing the service characteristics and assessing technical competitiveness, the desired target values for the service characteristics are defined to achieve customer satisfaction. The related degree of difficulty in achieving the desired target value is also determined based on the hotel leaders’ expert judgments. The cross-functional team used information on how the competitors were currently performing on the service characteristics; hence, they made crucial decisions about setting the desired target values. Desired target values are indications as to the degree of performance of the service characteristics to satisfy customer requirements. To define the desired target values, the measurement units and scales were used to define the service characteristics. Since the case hotel is a five-star business hotel, guest expectations are very high. Therefore, the desired target values were set high to increase the level of customer satisfaction with respect to competitors. In summary, this information can help hotel leaders deploy service design projects.

Analyzing the HoQ

Once the HoQ is complete, a final analysis is still necessary to ensure the development process builds on the QFD results. QFD matrix analysis in every phase will lead to the identification of design weaknesses, which must be dealt with as potential strength opportunities to make the product or service best in its class. A relatively simple procedure for analyzing the HoQ phase is to address the following points:

- **Blank or weak column:** This indicates HOWs that do not strongly relate to any WHATs. This does not exist in this case. The closest to this situation is “Guests feel safe as services are delivered to their room” in row 6, but it is not weak enough to warrant a preceding analysis. In other rows, there is at least one strong relationship.

- **Blank or weak row:** This indicates WHATs that are not being strongly addressed by a HOW. In this case, “staff courtesy” in column 19, “staff courtesy” in column 22, and “teamwork” in column 29 are the weakest. As “Guests feel safe as services are delivered to their room” has no strong relationship, eliminating “staff courtesy” in column 19, which has medium relationship with “Guests feel safe as services are delivered to their room,” may weaken the delivery of this even further.
- **Conflicts:** This determines whether the technical competitive assessment is in conflict with the customer competitive evaluation. There are no conflicts in this case between the assessments. For instance, “Hotel services are provided when promised” has a strong relationship with many HOWs including “promptness of check-in,” “promptness of check-out,” “problems resolution,” “timely arrangement,” and “handling guest’s mail and messages.” The hotel guests assigned a rating of 4 for this WHAT; on the other hand, the technical assessment assigned a rating of 4 for these HOWs.
- **Significance:** This determines which HOWs are significant. These are service characteristics that relate to many customer requirements, safety, and internal company requirements. By identifying the critical service characteristics, the characteristics that have significant impacts on the total design can be found. Target values assigned to these service characteristics will greatly affect the design, and the effects will propagate through the correlation matrix to other service characteristics causing positive and negative implications. The significant service characteristics in order of their importance rating are: “problem resolution,” “satellite TV,” “staff friendly behavior,” “phone (long distance and international line accessibility),” “radio,” “broadband & high-speed Internet connection,” “DVD/CD/MP3 player,” “proprietor & staff are on site and on call,” “handling guest’s mails and messages,” “fax/scanner,” and “fast & punctual.”

The correlation matrix shows positive correlations throughout without any negative correlation among them. Among these service characteristics, for the hotel guests who are mainly business travelers, “phone (long distance and international line accessibility)” and “broadband & high-speed Internet connection” are critical items. For the 475 rooms of the hotel, there were just 150 phone lines for the hotel guests to make internal and international phone calls. This was not adequate, according to the international standards and as the result of this study. Therefore, the hotel managers, considering the recommendations of the study, agreed that the hotel should provide at least 238 phone lines (one phone line for every two rooms). In addition, the hotel did not provide broadband and high-speed Internet connection such as ADSL; consequently, the guests had problems using voice and messenger software over Internet protocols. Hence, the hotel managers agreed that the hotel should offer a high-speed Internet connection to meet one of the important needs of business travelers.

- **Benchmarking:** The team should take the opportunity to incorporate the competitor’s highly rated HOWs. Here the team should investigate customer requirements where: 1) the WHATs that are performing well where their competitors are performing poorly; 2) the WHATs that are performing poorly compared to their competitors for benchmarking; and 3) service characteristics that need further development in phase II. In this case, the following characteristics can be placed in the second category: “Hotel services are provided as promised” and “Guests feel safe as services are delivered to their room.” WHATs in the first category are “Hotel staff are knowledgeable to answer guests,” “Hotel has good-looking furniture, soft furnishings and fittings,” “Hotel has comfortable beds, furniture and fittings,” “Hotel’s equipment and facilities appear clean and shining,” “Hotel rooms are equipped with the state-of-art entertaining devices,” and “Hotel

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Table 3 Process control characteristics matrix.

No	Service characteristics	Service process elements	Measurement unit	Measurement scales	Target values
1	Problems resolution (Front desk)	<ul style="list-style-type: none"> Problem resolution skill: <ul style="list-style-type: none"> Solve/Resolve the problem on time Solve/Resolve the problem accurately 	Percentage of problems solved on time in monthly period Percentage of problems solved accurately in monthly period	0-10%/11-25%/26-50%/51-75%/76-100% 0-10%/11-25%/26-50%/51-75%/76-100%	76-100% 76-100%
2	Satellite TV (In-room entertainment systems)	<ul style="list-style-type: none"> TV set characteristics: <ul style="list-style-type: none"> Image resolution TV screen size Ease of operation Programs availability: <ul style="list-style-type: none"> Type of available programs Number of available programs 	Resolution (visible scan lines: (i) interlaced/(p) progressive) Size (Inch) Number of operation Types of programs variety Number	480i/480p/720p/1080i/1080p 26"/32"/37"/42"/50" 6/5/4/3/2 Very low in variety/Low in variety/Fair in variety/High in variety/Very high in variety 10/20/30/40/50	480p 32" 2 Fair in variety 30
3	Phone (long distance and international line accessibility) (IT application)	<ul style="list-style-type: none"> Convenience of making calls Quality of communication: <ul style="list-style-type: none"> Voice clarity Accuracy of conveyed words Access to lines 	Interval scale Interval scale Percentage Interval scale	Highly inconvenient/Somewhat inconvenient/Convenient/Very convenient/Highly convenient Unclear/Very noisy/Noisy/Clear/Crystal clear 0-10%/11-25%/26-50%/51-75%/76-100% Difficult/Somewhat difficult/Easy/Very easy/Highly easy	Highly convenient Crystal clear 76-100% Highly easy
4	Radio (In-room entertainment systems)	<ul style="list-style-type: none"> Program availability: <ul style="list-style-type: none"> Types of programs available Number of programs available Clock system: <ul style="list-style-type: none"> Ease of set up Accuracy of set up 	Types of programs variety Number Number of operation Percentage	Very low in variety/Low in variety/Fair in variety/High in variety/Very high in variety 10/20/30/40/50 6/5/4/3/2 0-10%/11-25%/26-50%/51-75%/76-100%	Fair in variety 10 2 76-100%
5	Broadband & high-speed Internet connection (IT application)	<ul style="list-style-type: none"> High speed (transmit and receive information) Reliability and security Downloading capability: <ul style="list-style-type: none"> Speed Capacity Access to international channels via the Internet Convenience of communication via e-mails and messages such as chatting 	Speed (Kbps) Interval scale Speed (Kbps) Gb (Giga byte) Yes/No Interval scale	128/256/384/512/1024 Very low reliability and security/Low reliability and security/Fair reliability and security/High reliability and security/Very high reliability and security 128/256/384/512/ 1024 5/10/15/20/Unlimited Accessibility Highly inconvenient/Somewhat inconvenient/Convenient/Very convenient/Highly convenient	1024 Very high reliability and security 1024 Unlimited Yes Highly convenient

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Table 3 Process control characteristics matrix (continued).

No	Service characteristics	Service process elements	Measurement unit	Measurement scales	Target values
6	DVD/CD/MP3 player (In-room entertainment systems)	<ul style="list-style-type: none"> Ease of operation 	Number of operation	6/5/4/3/2	2
7	Proprietor & staff are on site and on call (safety & security)	<ul style="list-style-type: none"> Staff availability 	Yes/No (24 hours 7 days (24/7))	Available	Yes
8	Handling guest's mails and messages (Concierge)	<ul style="list-style-type: none"> Accuracy of delivered mails and messages Delivered mails and messages on time Voice quality 	Percentage Percentage of delivered mails and messages on time Interval scale	0-10%/11-25%/26-50%/51-75%/76-100% 0-10%/11-25%/26-50%/51-75%/76-100% Unclear/Very noisy/Noisy/Clear/Crystal clear	76-100% 76-100% Crystal clear
9	Fax/Scanner (IT application)	<ul style="list-style-type: none"> Printer features: <ul style="list-style-type: none"> Printing speed Printing memory Output resolution Fax features: <ul style="list-style-type: none"> Transmission speed Fax memory Copier features: <ul style="list-style-type: none"> Copy speed Copier memory Scanner features: <ul style="list-style-type: none"> Image resolution Scanner memory Reliability 	Per-minute (pm) Mb (Mega byte) Resolution (dpi) Speed (Kbps) Per-Minute (pm) Page-per-minute (ppm) Mb (Mega byte) Resolution (dpi) Mb (Mega byte) Interval scale	20/25/30/40/50 32/48/64/256/512 600/1200/2400/3600/4800 8/14.4/20.8/27.2/33.6 200/256/312/368/480 16/18/20/22/25 8/16/24/32/40 2400/4800/600/7200/9600 32/48/64/256/512 Very low reliability/Low reliability/Fair reliability/High reliability/Very high reliability	50 512 4800 33.6 480 25 40 9600 512 Very high reliability
10	Fast & punctual (Laundry & valet)	<ul style="list-style-type: none"> Done on time Done right the first time Cleanliness Well wrapped while delivering clothes 	Yes/No Yes/No Interval scale Interval scale	On time Right the first time Unclean/Somewhat unclean/Clean/Highly clean/Extremely clean Perished-wrapped/Outdated-wrapped/Fresh-wrapped/Pleasant-wrapped/Sensuous-wrapped	Yes Yes Extremely clean Sensuous-wrapped
11	Motivation (Hotel staff)	<ul style="list-style-type: none"> Staff motivation skill level 	Interval scale	Unmotivated/Somewhat motivated/Motivated/Well motivated/Highly motivated	Highly motivated
12	Teamwork (Hotel staff)	<ul style="list-style-type: none"> Teamwork excellence skill level 	Interval scale (on teamwork skills)	Lacking/Some/Enough/High/Impressive	Impressive
13	Training & education (Hotel staff)	<ul style="list-style-type: none"> Training: <ul style="list-style-type: none"> Type Hours Education: <ul style="list-style-type: none"> Degree Field (related to the hotel and hospitality) 	Training level Hour(s) in quarterly period Degree Yes/No	Basic/Intermediate/Upper-intermediate/Advanced/Professional 8/16/24/32/40 Low (High school)/Inadequate (Diploma)/Adequate (BSc)/High (MSc)/Excessive (PhD) Education is related to job	Professional 32 Adequate (BSc) Yes

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ambiance is attractive and has variety.” These WHATs should receive the greatest attention. For the third category, “problem resolution” has the highest rating at 3.26. This HOW has seven strong, three medium, and one weak relationship. The desired target value is 5 for very fast problem-resolution time, and the degree of difficulty in achieving the desired target value is 2. The service characteristics that have a negative or positive relationship with this HOW include “staff friendly behavior,” “training & education,” and “motivation.” These should be further developed in the second phase.

PHASE II: PROCESS CONTROL CHARACTERISTICS MATRIX

In this stage, the measurable or quantifiable characteristics have been defined for each service characteristic and prioritized from the HoQ to develop the process control characteristic matrix. There are some qualitative characteristics, however, such as “convenience of making calls,” “voice clarity,” and “well wrapped while delivering clothes.” An ideal target value for each of these characteristics has been set. As shown in Table 3, this matrix includes service process characteristics, measurement units, measurement scales, and target values. Some of these characteristics, however, are application-dependent. In other words, they are primarily applied to this hotel case study. All service characteristics are related to multiple service process elements, each with its own optimal target value. For example, “phone (long distance and international line accessibility)” service characteristic is related to service elements “convenience of making calls,” “quality of communication” (which is measured by “voice clarity” and “accuracy of conveyed words”), and “access to lines.” The measurement units for these process elements are “interval scale,” “interval scale,” “percentage,” and “interval scale,”

respectively (see Table 3). Assigned target values for these service process elements are “highly convenient” (for “convenience of making calls”), “crystal clear” (for “voice clarity”), “76 percent to 100 percent” (for “accuracy of conveyed words”), and “highly easy” (for “access to lines”). All of these service process elements are critical and need action plans developed in the next phase. From the development team’s point of view, as all of these are critical for deployment throughout the hotel, they should be deployed for further development in the third phase. In addition, special attention must be paid to these characteristics’ fields to satisfy and meet hotel guests’ needs captured in the HoQ.

PHASE III: ACTION PLANS MATRIX

After developing the second phase that resulted in measurable service process characteristics, the next step is to develop action plans for hotel managers to improve and maintain hotel services. This third phase in which these action plans are developed is called the action plan matrix. The team of experts from the case hotel, who were involved for the first and second phases, were also completely involved in designing and developing the action plans. An attempt was made to make all action plans measurable to maintain control over them. In addition, in accordance with its competitors’ current performance level, target values were assigned for each action plan that is shown in Table 3. In essence, these target values are used as the basis for monitoring the hotel performance when they implement the improvement actions. For example, the service characteristic “satellite TV” relates to the service elements “TV set characteristics” (which is measured by “image resolution,” “TV screen size,” and “ease of operation”) and “programs availability” (which is measured by “type of available programs” and “number of available programs”). With respect to the last element, the hotel guests had limited access to the international channels, because the hotel

Table 4 Action plans matrix.

No	Service characteristics	Service process elements	Action plans	Remarks
1	Problems resolution (Front desk)	<ul style="list-style-type: none"> • Problem resolution skill: <ul style="list-style-type: none"> o Solve/Resolve the problem on time o Solve/Resolve the problem accurately 	<ul style="list-style-type: none"> • Design various training syllabi for the new and seasoned employees • Define each level, and then prepare appropriate training for elevating the employee from each level to a higher level • Design specific certificate for each level • Design promotion procedure for staffs who successfully pass the program • Problems resolution procedures (tools) 	<p>Objectives: understand customers needs, understand the problem, develop a problem-solving process, document, formulate a solution, and understand failures of the problem-solving system and how to eradicate them (root-cause analysis).</p> <p>This program can be assigned just to front desk staff because they handle problems resolution.</p> <p>“Percentage of problems solved on time” (target 100%) and “percentage of problems solved accurately” (target 100%).</p>
2	Satellite TV (In-room entertainment systems)	<ul style="list-style-type: none"> • TV set characteristics: <ul style="list-style-type: none"> o Image resolution o TV screen size o Ease of operation • Programs availability: <ul style="list-style-type: none"> o Type of available programs o Number of available programs 	<ul style="list-style-type: none"> • TV: <ul style="list-style-type: none"> o 480p resolution (up to 480 lines, which is for regular TVs and is standard) o 32-inch plasma TV (475 TVs) o Operation instructions brochure • Listing of the program types (based on guests needs/wants) • 30 international channels (20 TV and 10 radio) 	<p>The current hotel satellite system is out of date and guests have access to a limited number of channels (approximately 14 channels). In addition, the radios in the rooms are connected to the bed and over the head. This is not common in hotels anymore. Also, updating satellite system is necessary for the hotel.</p> <p>There are 22-inch TVs in the rooms. As there are 475 rooms in the hotel, 475 sets 32-inch plasma TVs are needed for the new design. (Competitors in Tehran, for example, Esteghlal Hotel, have provided plasma TVs in the rooms.)</p>
3	Phone (long distance and international line accessibility) (IT application)	<ul style="list-style-type: none"> • Convenience of making calls • Quality of communication: <ul style="list-style-type: none"> o Voice clarity o Accuracy of conveyed words • Access to lines 	<ul style="list-style-type: none"> • Upgrade hotel phone lines to 238 lines 	<p>The hotel has 475 rooms; currently we have 150 phone lines for guests to make internal and international phone calls. We believe this is not enough and we should have at least 238 phone lines (every two room-one phone line).</p> <p>In order to develop the phone lines in the hotel, we need to upgrade the phone system; like the satellite TV system, it is out of date and cannot add additional phone lines.</p> <p>“100% accurate means 0 drop”</p>
4	Radio (In-room entertainment systems)	<ul style="list-style-type: none"> • Program availability: <ul style="list-style-type: none"> o Types of programs available o Number of programs available • Clock system: <ul style="list-style-type: none"> o Ease of set up o Accuracy of set up 	<ul style="list-style-type: none"> • 10 international radio channels 	<p>“100% accurate means 0 slippage per 24 hours”</p>

Table 4 Action plans matrix (continued).

No	Service characteristics	Service process elements	Action plans	Remarks
5	Broadband & high-speed Internet connection (IT application)	<ul style="list-style-type: none"> • High speed (transmit and receive information) • Reliability and security • Downloading capability: <ul style="list-style-type: none"> o Speed o Capacity • Access to international channels via the Internet • Convenience of communication via e-mails and messages such as chatting 	<ul style="list-style-type: none"> • 1024 Kbps ADSL (transmit & receive) /Static IP. 	<p>At the moment the hotel does not provide ADSL internet connection, it provides wireless Internet. This is appalling for a five-star business hotel in Tehran.</p> <p>Iran government has blocked some Web sites, even some news Web sites such as VOA!</p>
6	DVD/CD/MP3 player (In-room entertainment systems)	<ul style="list-style-type: none"> • Ease of operation 	<ul style="list-style-type: none"> • Connected to the TV • Operation instructions brochure 	<p>Now, we do not provide it in the hotel, but according to target value, we should consider it important in new design.</p>
7	Proprietor & staff are on site and on call (safety & security)	<ul style="list-style-type: none"> • Staff availability 	<ul style="list-style-type: none"> • Define job description (how they do their job) • (In the event of lacking staff for security) Hiring new employees with at least five years related experience in a five-star hotel. 	<p>This is just for people in the security guard who should be available on site 24/7.</p>
8	Handling guest's mails and messages (Concierge)	<ul style="list-style-type: none"> • Accuracy of delivered mails and messages • Delivered mails and messages on time • Voice quality 	<ul style="list-style-type: none"> • Setup a voice-mail system 	<p>Now, in the concierge division, a small box is being used in order to hold mails and messages. When there are plenty of mails or messages, it is hard to search for mails and takes time to deliver to hotel guests.</p> <p>In new design for the hotel, we have determined voice-mail system that is a Windows-based voice-messaging system designed specifically for hotels, which ensures that all guest messages are handled confidentially, delivered efficiently, and conveyed accurately.</p>
9	Fax/Scanner (IT application)	<ul style="list-style-type: none"> • Printer features: <ul style="list-style-type: none"> o Printing speed o Printing memory o Output resolution • Fax features: <ul style="list-style-type: none"> o Transmission speed o Fax memory • Copier features: <ul style="list-style-type: none"> o Copy speed o Copier memory • Scanner features: <ul style="list-style-type: none"> o Image resolution o Scanner memory • Reliability 	<ul style="list-style-type: none"> • Multifunctional color printer/copier/fax/scanner (six set) 	<p>Now, we have only four fax/scanners in the business center, but we should provide them in the Presidential Suites. We have two Presidential Suites and have determined one set for each one.</p> <p>We have determined an upgrade set as multifunctional color printer/copier/fax/scanner.</p>

Table 4 Action plans matrix (continued).

No	Service characteristics	Service process elements	Action plans	Remarks
10	Fast & punctual (Laundry & valet)	<ul style="list-style-type: none"> • Done on time • Done right the first time • Cleanliness • Well wrapped while delivering clothes 	<ul style="list-style-type: none"> • Washing extractor machine (high spin/the professional model/110kgs/large door) <p>(Characteristics that we should care about are machine capacity Kgs, usage current, washing with various detergents for example, watery detergents, powder detergents, and so on)</p>	At present, the hotel laundry machines and equipments are somewhat out of date and not enough to respond to the guests' needs. We have determined a need to add a professional model washing extractor machine besides other machines in order to reduce time of responding (in addition to other machines).
11	Motivation (Hotel staff)	<ul style="list-style-type: none"> • Staff motivation skill level 	<ul style="list-style-type: none"> • Design various training syllabi for new and seasoned employees • Define each level, and then prepare appropriate training for elevating the employee from each level to a higher level • Design specific certificate for each level • Design promotion procedure for staff who successfully pass the program 	Objectives: understand staff's motivations at work, how to motivate oneself, practice motivational techniques, and understand how job satisfaction can influence motivation and what can be done to enhance it.
12	Teamwork (Hotel staff)	<ul style="list-style-type: none"> • Teamwork excellence skill level 	<ul style="list-style-type: none"> • Design various training syllabi for new hires and for seasoned employees • Define each level, and then prepare appropriate training for elevating the employee from each level to a higher level • Design specific certificate for each level • Design promotion procedure for staff who successfully pass the program 	Objectives: working on team specifications, team strengths, team development, communication, problem solving.
13	Training & education (Hotel staff)	<ul style="list-style-type: none"> • Training: <ul style="list-style-type: none"> o Type o Hours • Education: <ul style="list-style-type: none"> o Degree o Field (related to the hotel and hospitality) 	<ul style="list-style-type: none"> • Define promotion procedure for staff who willing to keep their education • Hire new employees with at least bachelor's degree in hotel and hospitality management 	In the hotel, there are almost 30 employees with high school education

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provided only 14 channels. The hotel managers and the cross-functional team discovered some serious complaints about the number of available programs from the hotel records. Additionally, the competitor hotels in Tehran provide a variable number of

programs that range from 15 and 20 channels. Thus, management agreed to set the target for this element as 30 channels. Finally, action plans for attaining these measurements, as captured in Table 4, are as follows:

- TV:
 - o 480p resolution (up to 480 lines, which is for regular TVs and is standard) to achieve the required image resolution
 - o 32-inch plasma TV (475 TVs) to achieve the required TV size
 - o Operation instructions brochure to achieve the required ease of operation
- Program availability:
 - o Listing of the program types (based on guests needs/wants) to achieve the required type of available programs
 - o 30 international channels (20 TV and 10 radio) to achieve the required number of available programs

All action plans must be implemented to satisfy the hotel guests' needs or wants. The hotel managers may, however, prioritize the improvement activities based on the allocated budget and available resources.

CONCLUSIONS

This paper's main contribution is the development and implementation of a three-phase action plan based on the entire QFD methodology for a hotel. In addition, a unique feature of the proposed methodology is the employment of the SERVQUAL structure for identifying the key customer requirements of a hotel's guests. Hotel guest interviews determined that the SERVQUAL items were applicable and understandable; however, they needed specific modifications for and adaptation to this industry. By using a structured AHP questionnaire, the customer importance levels were obtained. The AHP analysis was used to develop ratio scale numbers for the importance ratings. Therefore, the calculations of weightings for the derivation of priorities are sound mathematically. Executing the recommended action plans at the final stage of the QFD process resulted in measurable improvements in the services provided by the hotel. From the hotel's management viewpoint

and the available budget, those action plans have been performed based on the recommended target values for the hotel. According to the action plans, significant improvements resulted from providing a washing machine (in the laundry section), providing broadband Internet connections in hotel rooms and the business center, and installing a voice-mail system. In addition, the other action plans will be implemented to reach a considerable improvement in hotel guest satisfaction. Also, the execution of these action plans is under control and is being monitored by the project management team.

QFD is a profitable tool for the service industry, specifically for the hospitality industry. This paper finds little research and few papers with limited scope that have been published to illustrate the application of the complete QFD process. Only a handful of publications extend beyond the HoQ. Most publications provide only an example of the HoQ. The documented results of this paper show that quality improvement projects could indeed benefit from the QFD methodology to relate customer needs to the internal procedures or actions of the organization to gratify and exceed customer expectations. In short, this paper can be used as a case study, demonstrating that the QFD process can be fruitfully applied in a hotel business.

The authors' challenge in applying the QFD started when assigning measurable units and quantifiable scales to the service process characteristics and developing the action plans. An overwhelming majority of these were, somewhat naturally, qualitative characteristics such as "convenience of making calls" or "access to lines." To cope with this challenge, which is not addressed in the current literature, interval scale measures were defined and developed for these qualitative characteristics for the first time. Future work is definitely warranted for this challenge. The useful tool in the process of translation was the employment of the fishbone diagram. This made the translation process complete and facilitated the challenging task of target setting for the

characteristics. Furthermore, hotels do face different types of guests such as businessmen, tourists, and political guests with different expectations. The generalization of this study to all hospitality industry is limited because it was performed on a five-star hotel.

Future Work

There are three main areas of future research that can benefit from this research. The first area is to apply a three-phase action plan based QFD in every division of a hotel in detail. Next, this research can be applied in other service industries such as healthcare, retail, restaurants, salons (beauty salons, spas), and health clubs. Finally, it would be beneficial to compare the advantages of the use of QFD in the service industry with manufacturing.

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