Study of Quality Function Deployment (QFD) in Service Industry

Sanchit Khanna, Vivek Arya
CDAC, Noida, India

Abstract

**QFD: The voice of the customer translated into the voice of the engineer.**

To design a product well, a design team needs to know what it is they are designing, and what the end-users will expect from it. Quality Function Deployment was developed by Yoji Akao in Japan in 1966 which is a systematic approach to design based on a close awareness of customer desires, coupled with the integration of corporate functional groups, which is used throughout the production phase. It is a complimentary method for determining how and where priorities are to be assigned while manufacturing a product or delivering a particular service.

QFD is a comprehensive quality system that systematically links the needs of the customer with various business functions and organizational processes, such as marketing, design, quality, production, manufacturing, sales, etc., aligning the entire company toward achieving a common goal. It does so by seeking both spoken and unspoken needs, identifying positive quality and business opportunities, and translating these into actions and designs by using transparent analytic and prioritization methods, empowering organizations to exceed normal expectations and provide a level of unanticipated excitement that generates value.

The scope of this paper is to analyze and understand in depth the concept of QFD, its various phases, how it is used with TQM, its benefits and various important tools associated with it like House of Quality, relationship matrix, correlation matrix, etc by referring research papers and journals.

This paper will suggest changes if any, required to meet customer needs in a better way in association with QFD in the service industry.

Keywords: Quality, TQM, Value, Customer

Introduction

"Time was when a man could order a pair of shoes directly from the cobbler. By measuring the foot himself and personally handling all aspects of manufacturing, the cobbler could assure the customer would be satisfied," lamented Dr. Yoji Akao, one of the founders of QFD, in his private lectures.

**Quality Function Deployment (QFD)** was developed by Yoji Akao in Japan in 1966 which is a systematic approach, to bring this personal interface to modern manufacturing and business. In today's industrial society, where the growing distance between producers and users is a concern, QFD links the needs of the customer (end user) with design, development, engineering, manufacturing, and service functions. QFD is:

1. Understanding Customer Requirements
2. Quality Systems Thinking + Psychology + Knowledge/Epistemology
3. Maximizing Positive Quality that Adds Value
4. Comprehensive Quality System for Customer Satisfaction
5. Strategy to Stay Ahead of The Game
As a quality system that implements elements of Systems Thinking with elements of Psychology and Epistemology (knowledge), QFD provides a system of comprehensive development process for:

- Understanding 'true' customer needs from the customer's perspective
- What 'value' means to the customer, from the customer's perspective
- Understanding how customers or end users become interested, choose, and are satisfied
- Analyzing how do we know the needs of the customer
- Deciding what features to include
- Determining what level of performance to deliver
- Intelligently linking the needs of the customer with design, development, engineering, manufacturing, and service functions
- Intelligently linking Design for Six Sigma (DFSS) with the front end Voice of Customer analysis and the entire design system

QFD is a comprehensive quality system that systematically links the needs of the customer with various business functions and organizational processes, such as marketing, design, quality, production, manufacturing, sales, etc., aligning the entire company toward achieving a common goal.

It does so by seeking both spoken and unspoken needs, identifying positive quality and business opportunities, and translating these into actions and designs by using transparent analytic and prioritization methods, empowering organizations to exceed normal expectations and provide a level of unanticipated excitement that generates value.

The QFD methodology can be used for both tangible products and non-tangible services, including manufactured goods, service industry, software products, IT projects, business process development, government, healthcare, environmental initiatives, and many other applications.

**APPROACHES TO QFD**

There are many approaches to QFD, depending on the strategic purpose of your project/service to be delivered. Here are a few of the most common ones:

**Technology-driven QFD**

You have a new capability, solution, or technology to implement. This QFD approach helps you find markets and perfect your solution to the unique needs of those markets.

**Cost-driven QFD**

You have a good product, but new markets or competitors are forcing cost/price reduction. This QFD approach helps you identify what you can do more cheaply, what is over-engineered and can be simplified or removed without negatively affecting customer satisfaction.

**Competitor-driven QFD**

Other companies have added features and functions to their products and your sales force is screaming that you must offer the same. This approach to QFD confirms if the competitive offerings address critical customer needs or are just gimmicky. If critical customer needs are being addressed, how can you do better than copying the competition? If gimmicks, how do you encourage the competition to continue to waste more money on solutions to problems customers do not have?

**Regulatory-driven QFD**

Governmental or industry standards and regulations have changed, or you wish to enter a market where they are different than what you follow today. This QFD approach helps identify what customers' needs are most affected by the regulatory change and must be protected in any redesign.

**Manufacturing-driven QFD**

New production equipment, facilities, locations, or workers are to be utilized. This QFD approach helps us identify the impact of operational changes and assure that critical customer needs are not negatively impacted.

**Reliability-driven QFD**

Your products are experiencing significant market or process failure modes, safety claims, or security

www.ijaegt.com
vulnerabilities. Improvement processes such as six sigma, kaizen, quality improvement stories, 7D/8D reports, etc. are not delivering significant enough improvement. This approach to QFD examines the environmental and situational sources of these problems, which often involve customer and user behaviors in order to help design more robust products.

**PHASES OF QFD**

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:

- 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
- 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).

**HOUSE OF QUALITY (HoQ)**

The first phase in the implementation of the Quality Function Deployment process involves putting together a "House of Quality". It is basically a diagram
resembling house showing relationship between customer desires and firm’s capabilities. The House of Quality is an assembly of several deployment hierarchies and tables, including the Demanded Quality Hierarchy, Quality Characteristics Hierarchy, the relationships matrix, the Quality Planning Table, and Design Planning Table. It is a table that connects dots between the Voice of the Customer and the Voice of the Engineer.

**Steps to the House of Quality**

**Step 1: Customer Requirements - "Voice of the Customer"**

The first step in a QFD project is to determine what market segments will be analyzed during the process and to identify who the customers are.

**Step 2: Regulatory Requirements**

Not all product or service requirements are known to the customer, so the team must document requirements that are dictated by management or regulatory standards that the product must adhere to.

**Step 3: Customer Importance Ratings**

On a scale from 1 - 5, customers then rate the importance of each requirement. This number will be used later in the relationship matrix.

**Step 4: Customer Rating of the Competition**

Understanding how customers rate the competition can be a tremendous competitive advantage. In this step of the QFD process, it is also a good idea to ask customers how your product or service rates in relation to the competition. There is remodeling that can take place in this part of the House of Quality.

**Step 5: Technical Descriptors - "Voice of the Engineer"**

The technical descriptors are attributes about the product or service that can be measured and benchmarked against the competition. Technical descriptors may exist that your organization is already using to determine product specification, however new measurements can be created to ensure that your product is meeting customer needs.

**Step 6: Relationship Matrix**

The relationship matrix is where the team determines the relationship between customer needs and the company’s ability to meet those needs. The team asks the question, “what is the strength of the relationship between the technical descriptors and the customer’s needs?” Relationships can either be weak, moderate, or strong or carry a numeric value of 1, 3 or 9.

**Step 7: Target Values for Technical Descriptors**

At this stage in the process, the QFD team begins to establish target values for each technical descriptor. Target values represent "how much" for the technical descriptors, and can then act as a base-line to compare against.

**Step 8: Correlation Matrix:**

This room in the matrix is where the term House of Quality comes from because it makes the matrix look like a house with a roof. Team members must examine how each of the technical descriptors impact each other. The team should document strong negative relationships between technical descriptors and work to eliminate physical contradictions.

**PRACTICAL APPLICATION**

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. The hotel and hospitality industry is often perceived as the most “global” in the service sector. 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.
“Capturing” is a new way for the hotel industry to collect customer data for service personalization. For example, the hotel may use the data from this opt-in activity to stock the customer’s favorite beverage in the in-room refrigerator before her arrival.

Delivery of such unexpected quality in service or product, as we call it ‘exciting quality’ in QFD, could certainly catch the customer’s attention. But for it to be effective, the baseline ‘expected quality’ must be fulfilled.

Following are the various journals and case studies to understand QFD and its implementation in hospitality industry:

**Article by Wall Street Journal - Ritz-Carlton Hotel**

In 1992, the Ritz-Carlton Hotel Company set a company-wide Quality Goal of:

1. Six Sigma;
2. 50% Cycle Time Reduction; and
3. 100% Customer Retention by 1996.

Toward this goal, each of the group’s hotels elected to champion a one-year research study on one of the critical processes that had been identified as vital to customers’ decision to continue patronage at their 30 properties worldwide. The Ritz-Carlton Dearborn in Michigan took on the process for “a clean, fresh, fully stocked guest room,” a process that could deliver better, faster, and cheaper housekeeping services within greater reliability.

A cross-functional team was formed comprised of Ladies and Gentlemen from Housekeeping, Laundry, Engineering, and Total Quality Management, with a goal of reducing cycle time by 50% and creating an error-proof, reliable process, which could be standardized company-wide for better customer satisfaction. The team’s first step was to make the existing process visible and establish baseline practice.

Using both macro- and micro follow charts, the team members observed room cleaning and collected over 30 random samples which allowed them to identify the patterns of workflow, distance traveled in cleaning a guest room, average number of defects per room, item usage, and cycle times per task.

This process modeling QFD activity helped the team better understand crucial customer-supplier relationships. For example, they developed an unanticipated awareness that Housekeeping was Laundry’s primary customer even though it was easy for them to see Laundry as a major customer.
supplier to Housekeeping. The discovery was an important lesson because insufficient supply of linen and towels was a company-wide defect. Data indicated each room attendant wasted 30 to 45 minutes daily in tracking down needed supplies. Practices ranged from walking to the Laundry department from the guest floors to learn product availability to hoarding supplies to taking supplies from co-workers’ carts or linen closets. The team also found that distribution of guest room supplies such as towels and linen to honor bar items and paper products was unreliable, resulting in mistakes, rework, breakdowns in process inefficiencies, variation, and discrepancies for honor bar billing. Waste due to this included lost labor dollars, wasted effort and travel, redundant work, and lost business. The Cost of Quality was calculated to exceed $460,000 annually for the entire Housekeeping system.

Because this study was conducted before Modern QFD was developed, this team resorted to building a classical House of Quality (HOQ) matrix in order to align customer requirements with supplier measures and to identify customer requirements. We might point out that today, this same analysis could be done more efficiently and faster by using more agile and easier-to-use Modern QFD tools such as the Maximum Value Table and without building a HOQ.

The Ritz-Carlton team then used brainstorming and benchmarking to develop process options and conducted pilot processes to test and fine-tune the selected alternative process. Their process improvement resulted in:

- Reduction in room cleaning cycle time to 65% or 8 minutes with the added task of servicing the honor bar;
- Reduction in defects per room by 42% to 3.7 which translates to a higher reliability in cleanliness factor;
- Reduction of standard guest room interruptions by 33% due to combining of honor bar task with cleaning team;
- Reduction in time guest would be disturbed if occupying room at time cleaning is provided;
- Increase in property/life safety for guests and staff due to fewer guest room doors being opened at any one time, as well as presence of more than one room attendant within a room;
- Increase in productivity from 13 to 15 rooms per person and still increasing with resultant labor savings; and
- Reduction in individual travel by 64% to 205 feet within guest room.

The team also reported intangible benefits such as reduction in loneliness and monotony, increased job enrichment and teamwork, better communication between team members and between guests and team members, and stronger customer-supplier relationship between Housekeeping and Laundry.

Case Study: Azadi Grand Hotel, formerly Hyatt Hotel

Azadi Grand Hotel, formerly Hyatt Hotel, with a 24-story high tower on a two-story podium and two basement levels, is the most famous hotel in the metropolitan area of Tehran, Iran. 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 flow down process was applied in this hotel.

PHASE I: SERVICE PLANNING (HoQ)

- 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. 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. 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.

**Identifying Service Characteristics (HOWs)**

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.

**Establishing Relationships Between the WHATs and HOWs**

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.

- Establishing Technical Correlations Matrix

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.”

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.

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, was 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.
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. 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.

The 3 main goals in implementing QFD are:
1. Prioritize spoken and unspoken customer wants and needs.
2. Translate these needs into technical characteristics and specifications.
3. Build and deliver a quality product or service by focusing everybody toward customer satisfaction.

Understanding Customer needs in QFD

The Kano Model is a useful tool in understanding customer needs in the QFD methodology. The Kano model categorizes customer needs into three groups—basic, performance, and excitement.

Basic needs are those that get a company in the market; they are not spoken unless violated. For example, at a hotel, you don't ask for a bed, you expect it to be there. If you show up and there is no bed, then you would speak the need (after it was violated).

Performance needs are known as those that keep a company in the market. They are spoken by the customer and considered when purchasing decisions are made. Performance needs make the customer happy or unhappy, and the customer's happiness is proportional to how well the performance needs are met.

Excitement needs are unspoken, which are beyond customer expectations. For this reason, they are generally unknown and difficult to uncover.

Evolution of Needs with Time

An extremely important aspect of the Kano model is the idea that needs evolve over time. As time marches on, excitement needs become performance needs and
performance needs become basic needs. The exciting and innovative needs get copied by competitors and become standard and expected. There are many examples of this in the auto industry where automatic transmission, cup holders, visors with clips, automatic windows, and airbags were once considered excitement needs and are now expected in a new vehicle. Express checkout at hotels, which used to be an excitement need, is now considered a performance need and electronic ticket check in at the airport is moving from an excitement need to a performance need.

The Tools of Service QFD

While traditional quality tools were developed to handle quantitative data, a new set of tools were created to handle the more qualitative language and relationships of ten associated with non manufacturing activities. The tools aid process reengineering for improving existing services, as well.

Matrix Data Analysis Charts are used to present the results of multivariate analysis of data. Particularly for customer segmentation, techniques such as conjoint analysis, cluster analysis, factor analysis, multiple regression analysis, and other techniques are useful when substantial quantitative customer data exists. This is the most mathematically sophisticated quality tool.

Affinity Diagrams are used to surface the deep structure in voiced customer requirements. This right-brained tool is generally produced by the KT Method developed by cultural anthropologist Jiro Kawakita Kawakita 19861. Team members can directly elicit customers’ natural organization of requirements. Also, makes a good first step for creating hierarchy diagrams.

Relations Diagrams also called interrelationship digraphs can be used to discover priorities, root causes of service process problems, and unvoiced customer requirements.

Hierarchy Diagram's also called tree diagrams or systematic diagrams are found throughout all QFD deployments to check for missing data, to align levels of abstraction of the data, to diagram the why/how nature of functions, and to diagram failures.

Matrices and Tables are used to examine two or more dimensions in a deployment. Common types include relationships matrix, prioritization matrices, and responsibility matrices.

Process Decision Program Diagrams (PDPC) are used to analyze potential failures of new processes and services.

The Analytic Hierarchy Process (AHP) is used to prioritize a set of requirements and to select from among many alternatives to meet those requirements. This method employs pair-wise comparisons on hierarchically organized elements to produce a very accurate set of priorities.

Blueprinting is a tool used to depict and analyze all the processes involved in providing a service. A variant of the diagrams used in time/motion studies.

QFD uses some principles from Concurrent Engineering in that cross-functional teams are involved in all phases of service development. Each of the three phases in a QFD process uses a matrix to translate customer requirements from initial planning stages through control and analysis. Each phase, or matrix, represents a more specific aspect of the service's requirements. Relationships between elements are evaluated for each phase. Only the most important aspects from each phase are deployed into the next matrix.

Quality Function Deployment and TQM

Through TQM practices, companies have been trying to improve service quality to earn customer satisfaction, besides their overall performance. But an image of the kind of TQM strategy which will efficiently earn this satisfaction in service industry is still vaguely presented. Most companies naturally focus on improving the quality of the product, while service quality – the steps taken to deliver the product – is not generally given priority. Thus, it is helpful for companies to know and understand the current practices and opportunities offered by TQM if they want pursue customer satisfaction by combining...
improvements in the product with those in the quality of service.
To provide a comprehensible image of TQM strategy in a service company, the present study collects data from a ‘Voice of the Customer’ survey, which describes how customers appreciate quality in products and services. The main research question is:

- How TQM can be implemented to achieve customer satisfaction in terms of quality of products and services?

A key to improving quality through TQM is linking the design of products or services to the processes that produce them. Quality Function Deployment (QFD) is a means of translating customer requirements into appropriate technical requirements for each stage of product or service development and production. The data are analyzed by the QFD method to gauge the level of customer satisfaction with products and service and to establish action plans for developing the potential of both.

It has been analyzed that implementing QFD successfully involves answering these 6 questions:

- **Voice of customer**: What does our customer need and want?
- **Competitive analysis**: In terms of our customer, who well we are doing relative to our competitors?
- **Voice of the engineer**: What technical measures relate to our customers’ needs?
- **Correlation**: What are the relationships between the voice of the customer and the voice of the engineer?
- **Technical Comparison**: How does our product or service performance compare to that of our competition?
- **Trade-offs**: What are the potential technical trade-offs?

### Benefits of QFD

Through this work following major benefits of the QFD can be interpreted:

- 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

### Conclusion and Recommendations

#### Conclusion

QFD is a profitable tool for the service industry, specifically for the hospitality industry. This project work 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.

So, through this study, we can say that since its introduction, Quality Function Deployment has helped to transform the way many companies

- Plan new services
- Design service requirements
- Determine process characteristics
- Control the servicing process
- Document already existing service specifications

In short, this project can be used as a case study, demonstrating that the QFD process can be fruitfully applied in a service industry.
Recommendations

The present work brings together information from diverse sources to offer a common starting point and information base for quality assurance professionals. The following recommendations and suggestions can be given based on above journal and case study:

- In most QFD studies, the House of Quality is not the starting point. In technology driven QFDs and Cost Reduction driven QFDs, the House of Quality may not even be created, this being the main reason for unsuccessful implementation of QFD in various companies.
- The difference between product QFD phases and service QFD phases must be understood. Taking services under consideration, 3-phases QFD must be implemented. The House of Quality is not QFD; it is to be followed by process control matrix and action plan matrix.
- QFD implementation should be carried out as a part of TQM, keeping in mind the defects allowed in Six Sigma.
- A continuous QFD needs to be deployed at the lowest level of operations. In addition, in order to make TQM work efficiently, companies need to build a corporate culture to replace continuous QFD.
- Each phase of QFD should not be confused with the other so that life cycle of analysis between one QFD and another is shortened and the company becomes more competitive due to the increasing speed of its innovations.

LIMITATIONS

Limitations

The limitations of this project study will be as follows:

- The study is based on the data that existed so far in journals and does not include any self implementation of this concept in any organization.
- The study is a theoretical analysis of QFD and its concepts that have been successfully used so far in service industry.
- Recommendations are based on shortfalls found in the research papers and journals read and analyzed only.
- Access to any organizational data where it is used was limited.

Future Scope

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.

BIBLIOGRAPHY

1. Journals and research papers

- Article by Wall Street Journal, 1992 regarding Ritz-Carlton Hotel
- QFD AND QFD approach to achieve customer satisfaction: a flour milling company case study by Maqsood Sandhu*, United Arab Emirates University, UAE

2. Internet websites:

- www.qfdi.org
- http://asq.org/learn-about-quality/qfd-qualityfunctiondeployment/overview/overview.html