**CHAPTER ONE**

**Introduction to quality function deployment**

 Quality Function Deployment (QFD) is one of the many management planning tools that modern organizations take advantage to achieve highest customer satisfaction. It is originated from Japan by Dr. Mizuno in 1972, and was introduced to the United States in 1984 by Dr .Causing of Xerox (Bester field, 1999). Now it has become a standard practice by most leading companies. Over the years some of the major proponents of QFD have been Volkswagen, General Motors. Quality Function Deployment In a few words: The voice of the customer translated into the voice of the engineer. QFD "is a method for developing a design quality aimed at satisfying the consumer and then translating the consumer's demand into design targets and major quality assurance points to be used throughout the production phase. ... [QFD] is a way to assure the design quality while the product is still in the design stage." As a very important side benefit he points out that, when appropriately applied, QFD has demonstrated the reduction of development time by one-half to one-third.

**1.1 House of quality (HOQ)**

 The house of quality is a type of diagram or planning matrix that helps to illustrate the relationship that exists between what a customer wants and the ability of a given good or service to fulfill those wants one of the benefits of the house of quality is that businesses can use this type of diagram to assess where the company is today in terms of meeting customer wants and needs. By identifying both strengths and weaknesses during the creation of the matrix, it is often possible to also begin brainstorming ideas on how to address those weaknesses without undermining any of the strengths already identified. From this perspective, it is possible to use the house of quality diagram as a springboard for making the supplier's house more solid and more attractive to its targeted consumer market or markets.

**Building A House Of Quality: 1.2**

List Customer Requirements (What’s)..1

List Technical Descriptors (How’s)..2

Develop Relationship (What’s & How’s).3

Develop Interrelationship (How’s)..4

Competitive Assessments..5

Prioritize Customer Requirements.6

Prioritize Technical Descriptor. 7.



House of Quality:Figure 1

**The Goal Of QFD 1.3**

 Is to translate often subjective quality criteria into objective ones that can be quantified and measured and which can then be used to design and manufacture the product. It is a complimentary method for determining how and where priorities are to be assigned in product development. The intent is to employ objective procedures in increasing detail throughout the development of the product.

**Implementing QFD 1.4**

The three 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.

Since its introduction, Quality Function Deployment has helped to transform the way

 :Companies many

 • Plan new products.

 Design product requirements.•

 Determine process characteristics.•

Control the manufacturing process.•

Document already existing product specifications. •

 **1.5 Benefit s of (QFD) are summarized below:**

1. Customer Driven.

. 2. Reduces Implementation Time

. 3. Promotes Teamwork

 . 4. Provides Documentation

 **When should QFD be used 1.6**

**QFD can be very helpful in the following cases:**

.Customers are complaining or aren’t satisfied with your product or service.1

Market share has been consistently declining..2

3. Extended development time due to excessive redesign, problem solving .

.Lack of a true customer focus in your product development process 4.

5. Poor communications between departments or functions.

.Lack of efficient and/or effective teamwork. 6

The bottom line of QFD is higher quality, lower cost, shorter timing and a substantial marketing advantage.

**Collecting Customer Information 1.7**

What Does Customer Really Want?

What Are Customer’s Expectations?

Are Customer’s Expectations Used To Drive Design Process?

What Can Design Team Do To Achieve Customer Satisfaction?

**1.8 Types of Customer Information**

1. Solicited, Measurable, Routine

2. Unsolicited, Measurable, Routine

3. Solicited, Subjective, Routine

4. Solicited, Subjective, Haphazard

5. Unsolicited, Subjective, Haphazard

**Prioritized Customer Requirements 1.9**

1. Importance Rating

2. Target Value

3. Scale-Up Factor

4. Sales Point

5. Absolute Weight & Percent

* + (Importance Rating)
	+ (Scale-Up Factor)
	+ (Sales Point)

**Prioritized Technical Descriptors 1.10**

1. Degree Of Difficulty.

2. Target Value.

3. Absolute Weight & Percent.

4. Relative Weight & Percent.

**QFD Processes: 1.11**

Phase I:
Product Planning.

Phase II:
Part Development.

Phase III:
Process Planning.

Phase IV:
Production Planning.

**1.12 QFD Objectives:**

Orderly Way Of Obtaining Information & Presenting It.\*

Shorter Product Development Cycle. \*

 Considerably Reduced Start-Up Costs.\*

 Fewer Engineering Changes.\*

Reduced Chance Of Oversights During Design Process. \*

Environment Of Teamwork. \*

 Consensus Decisions.\*

 Preserves Everything In Writing.\*

**CHAPTER TWO**

**LITERATURE REVIEW**

**2.1 Literature Survey**

Quality Function Deployment 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.

Marvin et al.[1] Research on service quality and customer satisfaction has become significant in the service industries. This study develops a case study that considers both external and internal service management issues and subsequent service innovations based on the framework of quality function deployment (QFD).

Abbie [2] Quality Function Deployment (QFD) is a process that originated in Japan for managing product development. In this article, Abbie Griffin presents results of a field-based, scientific study of US firms' efforts to implement QFD methods. Her research goals were to understand the QFD process as it is used and implemented, to begin to estimate US product development improvements attributable to QFD and to identify factors linked to QFD's successful use. Based on a study of 35 projects, she found that QFD demonstrated only relatively minor, short-term, measurable impacts on product development performance. Yet, the process may have the potential to improve the development climate in the long term, possibly leading to future, measurable improvements in development performance.

John [3] Purpose – This paper examines the relationship between organizational creativity, productivity and the underlying dimensions that foster quality function deployment (QFD).

Findings – There are three major findings in this research. First, the relationship between the QFD variables and organizational creativity is positive and significant. Second, the relationship between the QFD variables and productivity is stronger compared with the relationship between the QFD variables and organizational creativity.

Andrew [4] The House of Quality (HOQ) is a popular design tool that supports information processing and decision making in the engineering design process. While its application is an aid to conceptual aspects of the design process, its use as a quantitative information tool in engineering design is potentially flawed. This flaw is a result of potential designer interpretation of the HOQ results – interpretation which is invalid given the assumptions and information sources behind the HOQ – and is viewed as a critical limitation on the results of the method which can lead to potentially invalid and/or poor decisions. In this paper this limitation and its implications are explored both experimentally and through simulated application.

Yoji and Glenn[5] Quality Function Deployment (QFD) has been practiced by leading companies around the world since 1966. Its two-fold purpose is to assure that true customer needs are properly deployed throughout the design, build and delivery of a new product, whether it be assembled, processed, serviced, or even software, and to improve the product development process itself. This paper describes the evolution of the method, its current best practice, and proposals for future direction, not only to log its history and key players correctly, but also to convey the richness and depth of the applications throughout multiple industries.

Jose and Paulo [6] this paper presents a review, analysis, classification and codification of the literature on quality function deployment (QFD) produced between 2002 and 2006. The publications were classified into two main groups: conceptual research and empirical research. The studies focused more on quality matrix problem solving and the main difficulties are reported.

Benner et al. [7] the use of Quality Function Deployment (QFD) for the development of food products state that the method is potentially a useful tool. The use of QFD would enlarge the chance of success, produce higher quality products and decrease the cost and the development time. However, a scrutinous evaluation of the available literature dealing with the use of QFD for food product.

Biren [8] The paper reviews some historical developments in the quality function deployment (QFD) and extended house of quality (EHOQ) concepts that are popular for conveniently organizing product, process, and production planning information and for processing customer requirements. Since the inception of QFD in Japan in the early 1970s, it has met with varying degrees of success. This paper first reviews the literature and describes the EHOQ, which is a mature arrangement of QFD. Other related deployment techniques are examined, and a new concept called concurrent function deployment (CFD) is described. CFD is based on parallel deployment of several lifecycle “value plans” in addition to the “quality plan” used in QFD. CFD thus gives rise to integrated templates, called house of values (HOV), which are compared to EHOQ templates. The differences and similarities between QFD and CFD are discussed.

Yahia [9] the paper aims to review the fundamental concept of quality function deployment (QFD) and discusses the fact that a road to success for a new product development is the identification of customers' requirements and their conversion into engineering design requirements. Thereafter, it seeks to review the subject and to study four new cases on the topic of QFD.

Irem [10] In this paper, an attempt has been made to examine the applicability of QFD as a strategic decision-making tool after the construction stage of a housing project to determine the best marketing strategy, to make a comparison between the performances of different competitors and to transfer the experience gained from the current project to the forthcoming projects. For this purpose, a QFD team has been formed to collect and verify the expectations of the customer profile of the sample project, which was a high-rise building project located in Ankara, Turkey. The case study findings demonstrated that QFD could be successfully applied in the housing projects as a strategic tool to facilitate marketing decisions.

**CHAPTER THREE**

**Case study Analysis:**

In this chapter we present part of this work so we used Quality Function Deployment (QFD) in the provision of new services to customers, a service set up a new telecommunications company.

**3.1 Collecting Of Voice Of The Customer (VOC):**

We collect the views of customers about the best services like in a new telecommunications company, and we did a questionnaire which show us the views of customers about the best services that they want in their it was and through it we moved to the stage of critical to quality.

**3.2 Critical To Quality (CTQ):**

In this step we select, measurable characteristics that are key to a specific part of the product, service, or process that must be in statistical control in order to guarantee customer satisfaction.

The first step we made ​​in order to determine the CTQ to customers is the use of kano model.

**3.2.1 Kano Model Analysis:**

The Kano Model of Customer (Consumer) Satisfaction classifies product attributes based

on how they are perceived by customers and their effect on customer satisfaction. These

classifications are useful for guiding design decisions in that they indicate when good is

good enough, and when more is better.

**Project Activities In Which The Kano Model is Useful: 3.3**

☛ Identifying customer needs.

☛ Determining functional requirements.

☛ Concept development.

☛ analyzing competitive products.

And through them we have identified the most important CTQ's customers.

We have done a questionnaire to find out CTQ's customers.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Questions | 1 | 2 | 3 | 4 | 5 |
| 1.How important is the preferred method of contact you have: (text messages sms - comic mms messages - Messages audio - video call) | √ |  |  |  |  |
| 2. How important is that there are types of contributions.Such as: (members - government - industry - VIP – Commercial). |  |  |  |  | √ |
| 3.How important is the preferred method of payment you have: (ATM - bank transfer - Bank - IT Services - Telephone IVR) | √ |  |  |  |  |
| 4.How important is the provision of annual service payment system. |  |  |  |  | √ |
| 5.How important is to keep the customer contact in the case of expiration tally through the balance of emergency service. | √ |  |  |  |  |
| 6.How important is free messaging service in the sense that you have 3 free messages per day. | √ |  |  |  |  |
| 7.How important is that the company provide you with service in the case of force balance (3-minute call( | √ |  |  |  |  |
| .8.How important is to provide a balance transfer service. |  |  |  |  | √ |
| 9.How important is that the company will provide you borrow credits.. |  |  |  |  | √ |
| 10.How important is it offers you a service company to provide figures relating to your phone in the closing period. | √ |  |  |  |  |
| 11.How important is it to speak with (3 digits) 15 penny per minute, for example: 20 minutes) b 3 pounds per month 40 - minute by 6 pounds per month 60 - minute by 9 pounds per month) | √ |  |  |  |  |
| 12.How important is that the company provide you with service BLOCK))Meaning that choose from Ahadzq the time that suits you. | √ |  |  |  |  |
| 13.How important is that service delivery takes a short period. | √ |  |  |  |  |
| 14.The extent of the importance of providing the purest and best voice quality connection through HD voice technology. | √ |  |  |  |  |
| 15.How important is that the company provide you with online services. | √ |  |  |  |  |
| 16.How important is it to schedule the installation of the ADSL service:By:(At the time the customer - the customer's request - select a portion of the day favored by the customer). |  |  |  | √ |  |
| 17.How important is the immediate response to requests for repair breakdowns Internet during:.(hours - 72 hours - from the date of reporting 24 ) | √ |  |  |  |  |

**Table 3.1 Data Collection:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CTQ | A | I | Q | O | R | M | Total | Grade |
| 1 | 17 | 5 | 3 | 13 | 1 | 11 | 50 | A |
| 2 | 12 | 13 | 7 | 6 | 4 | 8 | 50 | I |
| 3 | 10 | 10 | 10 | 7 | 3 | 10 | 50 | A |
| 4 | 13 | 10 | 10 | 9 | 2 | 6 | 50 | A |
| 5 | 9 | 19 | 6 | 5 | 3 | 8 | 50 | I |
| 6 | 6 | 19 | 7 | 10 | 4 | 4 | 50 | I |
| 7 | 9 | 15 | 6 | 10 | 4 | 6 | 50 | I |
| 8 | 6 | 21 | 9 | 5 | 1 | 8 | 50 | I |
| 9 | 7 | 12 | 11 | 11 | 1 | 8 | 50 | I |
| 10 | 8 | 15 | 7 | 6 | 7 | 7 | 50 | I |
| 11 | 14 | 9 | 3 | 10 | 5 | 9 | 50 | A |
| 12 | 16 | 10 | 5 | 9 | 1 | 9 | 50 | A |
| 13 | 16 | 4 | 6 | 13 | 1 | 10 | 50 | A |
| 14 | 14 | 13 | 5 | 9 | 1 | 8 | 50 | A |
| 15 | 15 | 9 | 6 | 8 | 2 | 10 | 50 | A |
| 16 | 16 | 12 | 7 | 10 | 1 | 4 | 50 | A |
| 17 | 10 | 9 | 5 | 12 | - | 14 | 50 | M |
| 18 | 12 | 8 | 5 | 8 | 4 | 13 | 50 | M |
| 19 | 13 | 7 | 6 | 9 | - | 15 | 50 | M |
| 20 | 14 | 5 | 6 | 9 | 1 | 15 | 50 | M |
| 21 | 11 | 16 | 3 | 9 | 1 | 10 | 50 | I |
| 22 | 12 | 15 | 4 | 13 | - | 6 | 50 | I |
| 23 | 14 | 15 | 5 | 10 | - | 6 | 50 | I |

**Table 3.2 Results of Customers Survey:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CTQ | A | I | Q | O | R | M | Total | Grade |
| 17 | 10 | 9 | 5 | 12 | - | 14 | 50 | M |
| 18 | 12 | 8 | 5 | 8 | 4 | 13 | 50 | M |
| 19 | 13 | 7 | 6 | 9 | - | 15 | 50 | M |
| 20 | 14 | 5 | 6 | 9 | 1 | 15 | 50 | M |

Where:

O: One – Dimensional

I: Indifferent.

A: Attractive.

M: Must Have.

R: Reverse.

Q:Questionable result.

Based on the results of kano model the following results were the largest percentage of customers vote

1. Text Messaging Services.

2. Electronic Payment Services.

3. Internet Service.

4. The Automated Payment Method.

We have noted that increasing the number of towers on certain services are preferred and prefer to be present the highest quality so than ever show us that previous service to be the best increase coverage Towers in all places and thus offer the best level of quality service to customers. so the management should give a high attention to these features in order to get high customers satisfaction. `



Fig 3.1 Photo showing coverage Towers



Fig 3.2 Transmission of power transmission towers in the form of concentric circles

**3.4 House Of Quality Analysis:**

We have put Four CTQ chosen by customers in the Blank form of house of quality after that between the customers requirement CTQ and the process features.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Quality characteristicsCustomerrequirements | The speed of the message arrives | Electronic service is available at any time | Number of towers | Frequent presence of breakdowns in machinery |
| 1- Text messaging Service | • |  | ° |  |
| 2- Electronic payment services |  | ° | • |  |
| 3- Internet Service |  |  | • |  |
| 4- The auto mated payment method |  |  |  | • |

Where:

• Strong relationship

° Moderate relationship

**Where:**

|  |
| --- |
| Importance |
| Extremely important | • | 5.0 |
| Very important | • | 4.0 |
| Somewhat important | • | 3.0 |
| A little important | • | 2.0 |
| Not important | • | 1.0 |

**3.5 Failure Modes And Effects Analysis (FMEA):**

FMEA is a structured approach that ensures that potential product failure modes and their associated causes have been considered and addressed. Through the following table shows the failure rate in telecommunications companies.

**3.3 Failure Mode and Effects Analysis of Telecommunication Company Table**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Function | Potential failure mode | Potential failure Effect | Severity | Potential causes | occurrence | Detection | RPN | ActionRecommended |
| Internet service | The fall of the cable | Cut coverage | 9 | Bad weather | 4 | 3 | 108 | Be shielded cables and high quality in order to weather is not affected |
| Pressure on the network | Disabled in services | 9 | Limited number of companies and pressure on a single network | 9 | 2 | 162 | Increase towers to allow messaging |
| Text messaging service | The failure of the transmitter | Disable the service | 8 | Subscribers overload on the text messaging service | 6 | 1 | 48 | Be in more than one telecom company to ease the load on the network |
| Balance Transfer | The error occurs during conversion | Loss of balance | 7 | Because of an error in the number of the transferee | 8 | 1 | 56 | Provide balance to restore service in the event of a line |

**Note in the column Detection:**

Where:

1. Extremely likely
2. Very high likelihood
3. High likelihood

Note in the column  **RPN** that the biggest value was in the service of internet holidays, a

second pressure on the network where the value of RPN in the highest percentage holidays

any more dangerous is equal to **162**.

**CHAPTER FOUR**

**Conclusion and Recommendations**

 **4.1 Conclusion:**

 This research showed quality function deployment (QFD) that is a good tool to identify the needs of the people in order to ensure to provide good service in the telephone companies and be available to the highest quality. We reached to an ambitious pleasing customers using this methodology.

**4.2 Recommendations:**

 Based on the observations that we have that there is a telecommunications Company four main services(CTQ) to the customer are:

1- Text messaging service.

2- Payment of electronic services.

3- Internet Service.

4- automated Payment.

we recommend providing excellent coverage. and are available in all places and through Increase coverage Towers in all the places that customers need.

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**APPENDIX A**

**Table 3.1 Data collection:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CTQ | A | I | Q | O | R | M | Total | Grade |
| 1 | 17 | 5 | 3 | 13 | 1 | 11 | 50 | A |
| 2 | 12 | 13 | 7 | 6 | 4 | 8 | 50 | I |
| 3 | 10 | 10 | 10 | 7 | 3 | 10 | 50 | A |
| 4 | 13 | 10 | 10 | 9 | 2 | 6 | 50 | A |
| 5 | 9 | 19 | 6 | 5 | 3 | 8 | 50 | I |
| 6 | 6 | 19 | 7 | 10 | 4 | 4 | 50 | I |
| 7 | 9 | 15 | 6 | 10 | 4 | 6 | 50 | I |
| 8 | 6 | 21 | 9 | 5 | 1 | 8 | 50 | I |
| 9 | 7 | 12 | 11 | 11 | 1 | 8 | 50 | I |
| 10 | 8 | 15 | 7 | 6 | 7 | 7 | 50 | I |
| 11 | 14 | 9 | 3 | 10 | 5 | 9 | 50 | A |
| 12 | 16 | 10 | 5 | 9 | 1 | 9 | 50 | A |
| 13 | 16 | 4 | 6 | 13 | 1 | 10 | 50 | A |
| 14 | 14 | 13 | 5 | 9 | 1 | 8 | 50 | A |
| 15 | 15 | 9 | 6 | 8 | 2 | 10 | 50 | A |
| 16 | 16 | 12 | 7 | 10 | 1 | 4 | 50 | A |
| 17 | 10 | 9 | 5 | 12 | - | 14 | 50 | M |
| 18 | 12 | 8 | 5 | 8 | 4 | 13 | 50 | M |
| 19 | 13 | 7 | 6 | 9 | - | 15 | 50 | M |
| 20 | 14 | 5 | 6 | 9 | 1 | 15 | 50 | M |
| 21 | 11 | 16 | 3 | 9 | 1 | 10 | 50 | I |
| 22 | 12 | 15 | 4 | 13 | - | 6 | 50 | I |
| 23 | 14 | 15 | 5 | 10 | - | 6 | 50 | I |

**APPENDIX B**

**Table 3.2 Results of customer Survey:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CTQ | A | I | Q | O | R | M | Total | Grade |
| 17 | 10 | 9 | 5 | 12 | - | 14 | 50 | M |
| 18 | 12 | 8 | 5 | 8 | 4 | 13 | 50 | M |
| 19 | 13 | 7 | 6 | 9 | - | 15 | 50 | M |
| 20 | 14 | 5 | 6 | 9 | 1 | 15 | 50 | M |

**APPENDIXC**

**Table 3.3 House Of Quality Analysis:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Quality characteristicsCustomerRequirements | The speed of the message arrives | Electronic service is available at any time | Number of towers | Frequent presence of breakdowns in machinery |
| 1- Text messaging Service. | • |  | ° |  |
| 2- Electronic payment services. |  | ° | • |  |
| 3- Internet Service. |  |  | • |  |
| 1. The auto mated payment method.
 |  |  |  | • |

**Where:**

• Strong relationship

° Moderate relationship

**APPENDIX D**

 **Kano Evaluation Table:**

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