

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

186,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



# The Use of Quality Function Deployment in the Implementation of the Quality Management System

Elena Condrea, Anca Cristina Stanciu  
and Kamer Ainur Aivaz  
*"Ovidius" University of Constanta*  
*Romania*

## 1. Introduction

Nowadays a strong accent focus on quality, this period of time being considered like one of the "quality years".

Firms are forced to reduce losses from the sales more and lower and also to extend their dispatch markets concomitantly with new customers gain. The competition more and more intense brought in the first plan the idea that quality is not something added, not something good to be owned but a condition to survive.

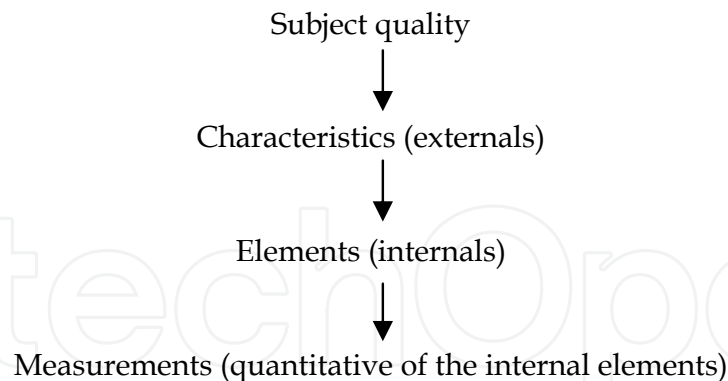
Being a complex item, quality couldn't be directly and easily measured and expressed, except for some technical characteristics and the majority of the economic one.

Quality depends also on corresponding materials, the equipments' performances, the technology, the technical control accuracy, the employee's suitable qualification etc. On the market, at a certain moment, several products could be found although they accomplish the same functions and have quite different performances and prices. To each set of performances correspond certain advantages, which could be quantified, but for each user, the advantages curve is different, in respect of the destination of the products.

Things look quite different if we try a quantitative expression of the quality or of a research project, an innovation initiative or of a business proposal. We could not talk about a quality "standard", or in any case, about a "universal" one. That's why it exists a need to find a very general method, with universal appliance, to permit each time the use some specific instruments.

As well, the conditions in which the products quality is determined are extremely complex, due to both objective and subjective elements.

Starting from here, B. Boehm, J.A. McCall, P. Richard and G. Walters structured a number of principles to allow a quantitative and objective measurement, in conformity with the scheme:



The main idea at the foundation of their studies is that the measure to express quality must result in an amount of numerous measurements, each having in view a certain characteristic. In conformity with the scheme, each product presents several characteristics to be appreciated. Each characteristic depends on an amount of internal elements of the subject to be measured, elements which could be quantitatively expressed [values of elements are to be found into numerical values of the characteristics and these, in their turn, will conduct to a quantitative indicator of the quality].

Meanwhile, with the reconsideration of the quality notion there appear also methods to allow finding solutions to better satisfy a certain buyer's segment. Such a method, known in the literature as *QFD* (*Quality Function Deployment* – extension of the quality function) or under the more familiar name of *House of Quality*, name given by the shape of one of the diagrams used which seemed to be a house, like having been designed by a child.

## 2. Quality function deployment. Theoretical aspects

Named also the "voice of customer", QFD is a systematic method to develop products/services based on expectations and desires of customers, the position on the market of these products and services and their efficiency.

The basic principle of the method is represented by the customer's requirements in each step of their trajectory.

Specific for this method is the fact that all the development and renewal of products and services activities are perceived from the customer's perspective.

QFD is a team method, being applied by a team of 6-8 people, who must be involved in all the firm's departments.

QFD represents in fact a planning process, made to help the design, production and marketing of some products and services taking into account the customer's opinion.

The method issued in 1966, initiated by the Japanese Yoji Akao, being used in fact for the first time in 1972 by Mitsubishi and starting with the 80s the method gained a large applicability both in USA and in Europe (1988), in order to design the development of different products, processes or projects.

Yoji Ajao defines QFD as being *a method which transforms the consumers requirements in quality characteristics and designs the quality of the finished product/service, through the systematic*

*development of the relationships between demand and characteristics, starting with the products/services functions, followed by its characteristics, its components characteristics and ending with the stages and characteristics of the processes from which it results.*

The objectives of the method could be structured as follows:

- Structuration of the design process;
- Reduction of the design cycles;
- Transformation of the customer “voice” in technical requirements and quality plans;
- Increasement of the quality level of the final products.

The advantages of using QFD are to be:

- The customer needs are restored more accurate into the specifications of the products/process design;
- Shorter design and development cycles;
- Lower costs, high productivity;
- Documentary orientation;
- The team involvement;
- Experience and information are structured into a concise format, easy to be assimilated.

The method allows the elaboration of a project concerning the clients’ requirements. First of all it must take place an inquest to establish which are the functions of the products expected by the customers and also their importance. Then the characteristics are settled and after that they are correlated with functions. In the meantime, some comparisons with other firms’ performances are made and also the characteristics are analyzed in their relationship, in order to observe which ones are correlated and which ones are opposite.

Then, similarly, from the characteristics, the methodology follows with technical measurable performances and then with materials technology.

## 2.1 Short history of QFD development and application

QFD method was developed in Japan at the end of the 60s by the professors Shigeru Miyuno and Yoji Akao. At that moment, the statistic control of the quality, introduced after the 2<sup>nd</sup> world wide war, had already roots in Japan. New quality methods were introduced, with the contribution of the quality control involvement in the business management, process known afterwards as TQC or TQM.

Professors Mizuno and Akao intended to develop a method to guarantee the quality, a way to make a product suitable for clients, before its issue on the market. Till that moment, the quality control methods were focused on the settlement of difficulties issued during the production or after.

The first important scale application was presented in 1966 by Kiyotaka Oshiumi from Bridgestone Tire in Japan. He used a “fish bone” diagram to discover the customer’s expectations (outputs), and those characteristics and factors of the process (causes) which influenced the respective result.

This method was first used for the growth of the Naval Shipyards’ performance, belonging to Mitsubishi. Initially, it was used to improve the quality of the company’s products; in

time, however, they realized that, using the same analysis technique, the method could be used for the improvement of the quality belonging to every activity within an economic unit which produces or carries out services.

In time, certain famous Japanese companies had confirmed the method’s efficiency, Toyota being among them, who introduced it in 1977 and which, in a 7 years application period, lowered the fabrication costs of an automobile by 40%, while significantly raising the quality and lowering the fabrication cycle.

In 1986, Ford and Xerox, in the United States, adopted the method.

QFD means a *mot-a-mot* translation of the Japanese words “*hinshitsu kino tenkai*”, but first was translated like evolution of the quality function; name suggested by dr. L.T. Fan in 1978.

At the first workshop (seminar) about QFD in USA, the sponsor Masaaki Imai seemed that “*evolution*” doesn’t reflect the sense of “*change*” and consequently, “*hinshitsu tenkai*” could be better translated like “*the quality development*”. In that manner appears the name of QFD (*Development of the Quality Function*).

At the foundation of QFD method there is the *House of Quality*, a set of matrix used to link the voice of customer with the technical needs of a product, the control plans of the process and the production operations.

In the scheme (fig.1) we can observe the structure of the *House of Quality* and explanation of each component:

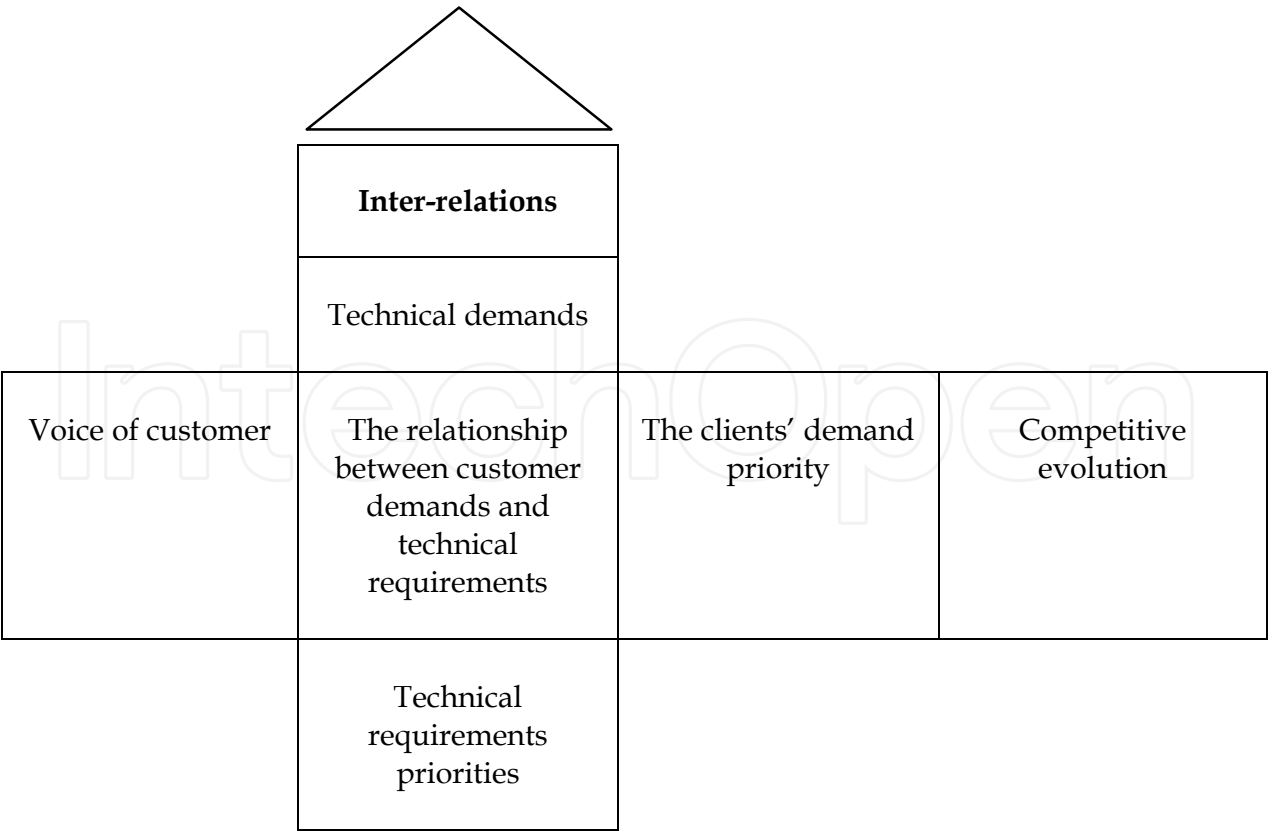


Fig. 1. The structure of the House of Quality

2.2 QFD methodology

The central point of the diagram looks like a table with two entrances. On the rows there are the customers requirements and on the columns is underlined the correspondance between the customer’s expectations and the quality characteristics of the respective product or service. This matrix or table is named *the matrix of relations*.

The QFD is also called the “House of Quality” because the solving solutions of the discussed problem are found in a series of matrix arranged as a house consisting of foundation, first floor, attic and roof, as you can see in fig. 2.

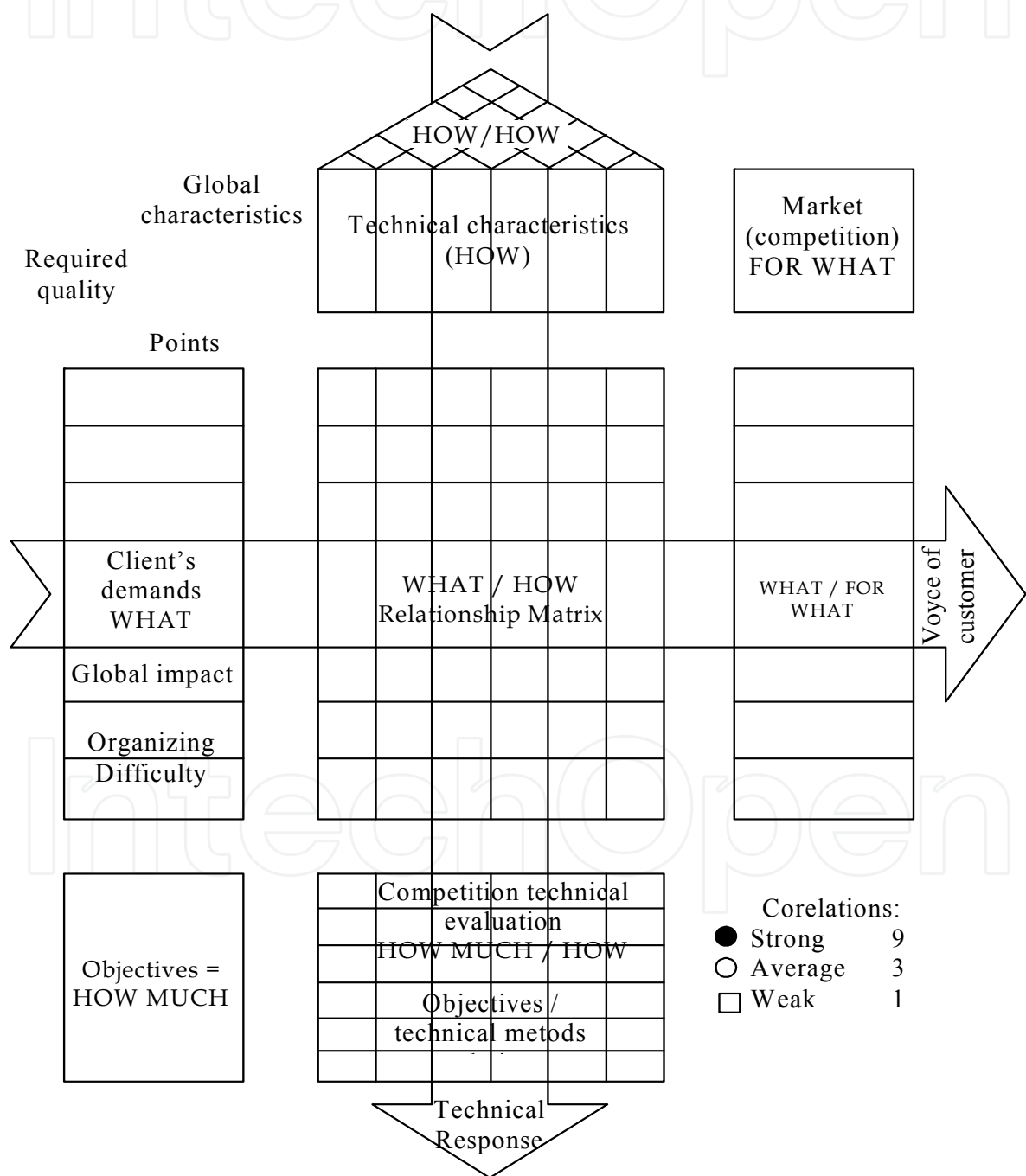


Fig. 2. QFD example

Thus:

*The first floor* is build out of “the client’s voice” and here we find:

- The problem’s/client’s demands;
- The correlation matrix of the problem’s demands with the characteristics required by their solving;
- The matrix which represents the firm’s position in comparison with the main competitors, for each demand of the analyzed problem;

*The house’s foundation* consists of:

- The technical evaluation matrix of the main competitors;
- The objectives and technical measures needed in order to solve the analyzed problem;

*The house’s attic* consists of the characteristics and/or methods needed to solve the problem’s demands.

*The house’s roof* represents the correlation matrix of the technical characteristics.

In addition to these building elements of the *House of Quality*, the analysis also requires to be made the correlation between the elements that form the *House of Quality*.

Generally, there are three types of correlations:

- Strong;
- Average;
- Weak.

It comes by itself the fact that there is the possibility of not having a correlation between some elements of a matrix.

Each correlation category will be given a certain score, as well. A codified representation of each correlation category is recommended, in the purpose of x having a more suggestive matrix representation.

**The steps** of developing a QFD analysis are as follows:

1. The selection and preparation of the problem;
2. Establishing the demands (WHAT), which means:
  - Identifying the problem’s demands or the client’s wishes (the client’s voice);
  - Their importance (giving points, percentages or hierarchizing the demands).
3. The perception and judging of the competition (FOR WHAT), which presumes the following:
  - Gathering information about the market;
  - Commercial information;
  - Comparing with the main competitors , focusing on each of the clients’ demands (WHAT/FOR WHAT);
4. Establishing the technical characteristics and/or methods that could compete to solve the analyzed problem (HOW);
5. Completion of the correlations in the WHAT/HOW and HOW/HOW matrix;
6. Technical competition evaluation, which means:



- Comparing each technical characteristic with the competition (HOW MUCH/HOW);
  - Calculating the importance of the technical characteristics and their hierarchizing;
  - Filling out the “Global impact” and “Organizing difficulty” rows.
7. Exploitation, binocular vision, which means analyzing the WHAT/HOW matrix’s coherence;
  8. Carrying out the quality improvement process, which presumes:
    - The process of improving the product’s/service’s quality;
    - Extending the analysis.

The QFD analysis can be pictured as a branching graph, meaning that from each of the resulting problems’ diagrams, new QFD analyses can be made.

With the QFD method, regarding the quality control and assurance, there can be put into practice other methods, techniques or instruments taken from the quality theory or management, such as:

- National, regional, international standards;
- Market studies;
- The statistical control of the products/services;
- The Pareto Diagram, difference cause-effect Diagrams, Brainstorming Method etc.;
- The Quality Circles etc.

QFD does not limit itself only to technological problems; it can also be applied to aspects regarding the reliability and costs, allowing for the definition of priority action directions (opportunities of technological nature or a difference nature, risks’ analysis etc.).

It can be said that, an important advantage of the QFD method is given by the *possibility of identifying the clients’ latent demands* (demands which have not manifested themselves, yet).

In the application of the method some steps are to be followed:

1. Determination of the customer’s requirements and the importance for them.
2. Identification of the quality characteristics by the work team. The degree of requirements coverment through characteristics is evidenced by a score system (graph).
3. Determination of the quality characteristics which are to be performed for the new product and evaluation of the difficulty graph to be obtained. Concomitantly is processed also the sense of variation preferred for this values (increasement, decreasement, indifference).

The evaluation of interaction and correlation between characteristics is emphasised in the correlation matrix (the superior zone of the diagram which forms the roof of the house).

4. The compared analysis of product/service planned with the product/service of competitors from 2 points of view:
  - a. From the clients point of view;
  - b. From the technical point of view.

Comparing the quality characteristics of products/services with those of the competitors.



5. Establishment of the final values of quality characteristics for the new product.

The building of a *House of Quality* requires 6 basic steps:

### 1. Identification of the customer needs

The voice of customer remains at the base of the QFD process. Here below there are some essential approaches regarding gathering information from the clients:

- c. Official polls
- d. Focus groups
- e. Direct contacts with clients
- f. Claims analysis
- g. Online monitorization.

### 2. Identification of technical needs

Technical needs are characteristics that describe the customer needs in the designer language. There must be measurable because the result is controlled (checked) and compared with the target objectives. The roof of the house shows the relationship being converted, using a series of symbols. A typical scheme uses the “●” symbol for very strong relationships and a “□” for weak relationships. For example, two technical requirements of certain superior services are the capacity, staff and equipment of a clinic. The relationship between them is strong and, in order to increase the capacity, more staff and equipment are needed.

### 3. The link between the customer needs and the technical needs

The customer needs must be written in the left column and the technical ones on the top. Inside the matrix the symbols indicate the type or relation in a similar way with those used at the roof of the House of Quality. The purpose of this matrix is to show if the final technical needs cover the customer needs. This kind of evaluation is usually based on the experts' experience, customer's reaction or controlled experiments.

The lack of a solid link between the customer needs and the technical ones show both that the needs are not covered and that the final product will hardly accomplish them.

And if a technical need doesn't affect a customer need it could be useless, or the designers might forget an important need of the customer.

### 4. Addition of the competitive evaluation and of the sale key points

In this stage the importance of every customer need is evaluated and the competitor's products and services are the ones which cover these needs and are also researched. These evaluations are very important and reflect the customer's expectations. Competitive evaluation underlines the strengths and weaknesses of the competition. Due to this stage, designers could discover methods to improve products and QFD method and the strategic vision of the company shows the priorities of the important customer are not satisfied by the competitor's products (such as family activities), thus, the company could obtain advantages by focusing on these aspects. The respective needs become sale key points and lie at the foundation of the marketing strategies.

**5. Evaluation of technical needs of the competitive products and services and establishment of targets**

This stage happens usually on the base of information added or products tested. These evaluations are compared with the competitive evaluation of the customer’s needs in order to determine the disparities between the customer’s needs and the technical ones.

If it is proved that a competitor product satisfies the customer’s needs but the evaluation of the technical needs shows something else, then even the measurement was wrong, even if there is a difference of image (be it positive for competitor, or negative for the company product) which affects the consumer perception. For example, customers say they give a great importance to family and in the meantime, the competitive evaluation shows that these aspects are not accomplished. The establishment of a target regarding this need will satisfy the consumer need and will offer an advantage against the competitor’s products.

**6. Selection of the technical needs to be modified in the process**

In this stage there are identified the technical requirements which have a strong link with the customer needs, that are considered sale key points. In the rest of the process, the customer voice will be taken into account. Features not being considered critical don’t need a greater attention, for example, the key factors in a fitness Centre are: the program, the equipment, the fee and the access to the Internet.

The six stages are just the beginning of the QFD process. There are used three houses of quality to develop the main parts of the customer needs, the process plan and the quality control.

The second house is very similar with the first, but it refers to the subsystem and components.

The technical needs of the first house of quality are described in detail (fig.3.).

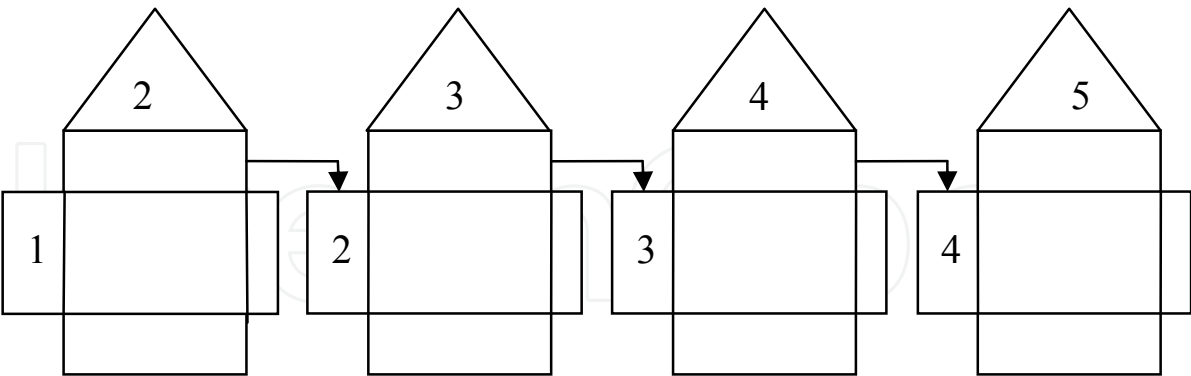


Fig. 3. The four quality houses – fill them in

Legend:

- 1. Client’s needs;
- 2. Technical needs;
- 3. Components’ characteristics;
- 4. Process operations;
- 5. Quality control plan.

At this moment, the target values, function and aspect are to be settled. For example, the program of a fitness Centre could be partaged into: program for children, for family, etc. each with their specific needs and therefore, each with its own house of quality.

In the field of production, the majority of the QFD activities are represented by the first two houses which are displayed by developing the product and the engineering function. The next stage refers to needs surveyors and line operators.

In the third house, the process plan makes the link between the characteristics of the components and the key operations. That makes possible the passage from the plan to the application.

In some cases, there are used more simple houses of quality, which exclude the competitive analysis. For example in the health national organizations, competition doesn't interest anybody.

### **3. Optimizing the activity of S.C. ELDA MEC S.R.L. through the application of the Quality Function Deployment method**

QFD was applied within ELDA MEC SRL Constanta in order to establish a product, which optimally corresponds with the dairy products consumers.

#### **3.1 Presentation of S.C. ELDA MEC S.R.L. Constanta**

S.C. ELDA MEC S.R.L. is a company with limited responsibility, with a completely private capital, established in 1996; activity field: *production and commerce of dairy products*.

The company's headquarters is on Dumbrava Rosie Str. no 5, Constanta.

Work points – the company's headquarters and, respectively, in Topraisar, Constanta County, Romania (starting from July 2007).

In the purpose of carrying out this activity, the company owns fabrication licenses for the following products:

- Milk for consumption;
- Acidophil products;
- Fresh cow cheese, creams;
- Sour cream for consumption and whipped cream;
- Hard paste cheeses.

The products made and commercialized by Elda Mec are presented in table 1.

Currently, the unit is in conformity with European sanitary-veterinary norms regarding the production on a national level (L 41) and is carrying out the program for preparing the prime materials' suppliers for export quality.

Presently, the company has 15 employees, who assure a good functioning for the current production capacity.

Nr. crt.	Product name	Pakage	Quantity
1.	Fat yoghurt	PET bottle	900 g
2.	Fat yoghurt	PET bottle	2 kg
3.	Sana	PET bottle	900 g
4.	Yoghurt cream	PET bottle	900 g
5.	Diet yoghurt	PET bottle	900 g
6.	Fresh cow cheese	Plastic casserole	500 g
7.	Fresh cow cheese	Plastic bucket	5 kg
8.	Făgăraş cheese	Plastic casserole	250 g
9.	Sour cream 25% fat	Plastic casserole	450 g
10.	Sour cream 20% fat	Plastic casserole	450 g
11.	Sour cream 20% fat	Plastic bucket	5 kg
12.	Cow telemea	Plastic box	15 kg
13.	Delicatesa Elda	Plastic bucket	8 kg

Table 1. The products made and commercialized by Elda Mec SRL Constanta, Romania

3.1.1 The analysis of the marketing environment

- The consumption market of these products is in continuous expansion due to the curing qualities of the dairy products. An important factor in this growth is represented by *The Alliance for Educational Milk Advertisement*, a nation-wide program for informing the people about the benefits of consuming milk and industrially-processed dairy products. This program informs people about the benefits of milk and industrially-processed dairy products rather than the unprocessed ones, about the increase of hygiene-sanitary quality and nutritional value through industrial processing.
- This type of products is available to any consumer, milk being a food rich in calcium and phosphorous which decisively contributes to the growth and upkeep of the bone system and a good functioning of the muscles and nervous impulses transmission. Moreover, milk contains the vitamin complex B (B1, B2, B6, B12), which has an important role in the prevention of fatigue and nervous states.
- Given the fact that, on the Constanta market, there are not that many companies to cover the demand for fresh dairy products, S.C. ELDA MEC S.R.L. has the opportunity to impose itself among the other competitors, because it offers higher quality products to the consumers.
- For distribution, S.C. ELDA MEC S.R.L. uses its own transportation, equipped with storage installations for optimal product storage.
- S.C. ELDA MEC S.R.L. distributes its products especially through the retail network, together with the wholesale, having sealed contracts with the main local trade chains and with some large public alimentation unit chains, restaurants with commercial vocation on the whole Romanian seashore. Moreover, the company intends to build its own trade network, in time.
- *The consumers' demand regarding the market's offer:*
  - The production of milk and dairy products has risen by 95% in 2000-2009, while the annual average consumption of milk and dairy products has grown with 19% in the same period.

- It is important the fact that, in the last years, the consumers are orientating themselves more and more towards high quality products, which offer consumption safety and the natural characteristics of milk. Thus, the yoghurts and cheeses obtained through pasteurizing technological processes, followed by implanting of carefully selected bacteria and molds. The products obtained by the company respects the consumers’ norms regarding quality and taste. Furthermore, after the implementation of the current project, the product diversity and quality is to be improved.
- In conformity with the Nielsen press statements and those of the Romanian Milk Industry Patronal Association, the yoghurt and sour cream segment is the only one which has grown by 3-5% even in the crisis periods.
- In conformity with Nielsen, the dairy product buyers choose, mostly, hypermarkets (over 40%) when buying these products, followed by supermarkets (20%), discounters (15%) and local shops (10%).
- The yoghurt segment remains, for the Romanian consumer, an item in the daily basket = an item present in day to day consumption of each Romanian household.
- What regards the milk and dairy products demand, we can say that, while under a certain price level, it is inflexible. However, it is sensible to the growth of the consumers’ incomes, proof being the consumption evolution in the last years.

3.1.2 SWOT Analysis S.C. ELDA MEC S.R.L. Constanta

<p><b>Strengths</b></p> <ul style="list-style-type: none"><li>• High quality products;</li><li>• The implementation of the HACCP Plan for most of the manufactured products;</li><li>• Varied product types equipment, orientation towards traditional products;</li><li>• Intermediate price situation, between economy and middle range</li><li>• Safe and secure, own distribution</li><li>• Location (are with high economic and touristic potential)</li></ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"><li>• Fluctuating personnel</li><li>• Low number of distributors</li><li>• Poor product advertisement</li><li>• The lacking of a performant complete laboratory analysis;</li></ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"><li>• The opening of new commercial units chain and units for public alimentation, especially restaurants with commercial vocation;</li><li>• Multiple possibilities for assortment diversification</li><li>• Accessing nonrefundable funds for development</li></ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"><li>• Direct competition</li><li>• EU norms imposed to Romania in January 2007</li><li>• The fluctuation of the company’s employees, especially after joining the EU</li></ul>

### 3.1.3 Activities proposed for completion within the firm after the SWOT Analysis

- Widening the product equipment, as to fulfill the demands of as many consumers as possible
- Fabrication of new products based on traditional Romanian recipes
- Intensification of the advertisement actions regarding the products made by *ELDA*, of the Elda Mec company in general
- Increasing of the distributors' number, and that of the distribution channels
- Expansion of the market coverage; selling the products to as many commercial chains as possible (national and international)
- Commercialization of some products (Yoghurt, Sana) under other distributor's brand
- Accessing nonrefundable funds so that the whole production-selling process responds to the EU norms' requirements
- Increasing the investments towards establishing a performant laboratory analysis

### 3.1.4 S.C. ELDA MEC S.R.L. Constanta objectives

- To increase production capacity, at the same time following the reaching and maintaining of a high quality level;
- To certify the Quality assurance system in conformity with ISO 9001 and the HACCP Plan (Hazard Analysis. Critical Control Points) in the new production unit.
- To implement the ISO 14000 environment standards.
- To satisfy the demands (needs) of the clients through the assurance of products which are as diverse as possible and of a high quality.
- To inform and educate the consumers in order to differentiate natural products, respectively the dietetic ones from the other products from the same array.
- To accentuate within the advertisement campaigns the quality difference and the therapeutically qualities of the natural dietetic dairy products in comparison with other dairy products available on the market.
- To increase the market share in the Constanta area – currently we have a share of over 40% in the city of Constanta, being found in numerous supermarkets, Selgros and Mega Image.
- To increase, on a yearly basis, the sales with at least 10% in order to, in up to 3 years, make the ELDA firm known through its quality not only on the Dobrogea market, but on the whole Romanian one and even in some European Union markets.

### 3.2 Applying the QFD method within ELDA MEC S.R.L. Constanta

The application of the QFD method at the firm Elda Mec S.R.L. Constanta, Romania aims to establish the optimal ratio between the functions and the quality characteristics of products in order to optimal correspond to the customer's requirements.

The analyse focus on the 3 products presented as follows:

- Fat Yoghurt;
- Low fat yoghurt;
- Cream of yoghurt.



The quality characteristics of the mentioned products are found in the product papers below:

*Fat Yoghurt product paper*

Made from: cow milk;  
Types: fat;  
Organoleptic and physic-chemical characteristics:

Characteristics	Fat
Aspect and consistency:	Thinner consistence, without zer-eliminating gas bubbles
Color:	White, milk color or a slightly yellow tint
Smell and taste	Yoghurt specific, pleasant, a bit bitter, without foreign taste or smell (sour, moldy).
Fat, %, minimum	2.8
Dry substance, %, minimum	9.0
Acidity, dgr. T	75 – 140
Proteic substances, %, minimum	3.2
Delivery tempterature, dgr.C, maximum	8
Whey, %, maximum	5

Quality control, marking, storage, transport:  
Lot establishment: lot = max 5000 kg, yoghurt of the same type, package, presented at the same time at verifying.  
Packaging: 900g PET bottle, 500g PET bottle, 2 kg PET bottle and 5 kg bucket.  
Marking: marking or labeling with: factory brand, product name, type or fat content, net weight, expiration date, fabrication standard.  
Storage: clean refrigeration spaces clean, at 2-8 dgr. Celsius.  
Transport: clean, dry covered vehicles, at 8-12 dgr. Celsius.  
Consumption indications: it can be consumed by all consumer categories, which do not have allergies or medical contraindications regarding the product’s components.

*Low fat yoghurt product paper*

Made from: cow milk;  
Types: light;  
Organoleptic and physic-chemical characteristics:

Characteristics	Easy
Aspect and consistency:	Thinner consistence, without zer-eliminating gas bubbles
Color:	White, milk color or a slightly yellow tint
Smell and taste	Yoghurt specific, pleasant, a bit bitter, without foreign taste or smell (sour, moldy).
Fat, %, minimum	0.1
Dry substance, %, minimum	8.5
Acidity, dgr. T	75 – 140
Proteic substances, %, minimum	
Delivery temperature, dgr.C, maximum	8
Whey, %, maximum	5



Quality control, marking, storage, transport:  
Lot establishment: lot = max 5000 kg, yoghurt of the same type, package, presented at the same time at verifying.  
Packaging: 900g PET bottle.  
Marking: marking or labeling with: factory brand, product name, type or fat content, net weight, expiration date, fabrication standard.  
Storage: clean refrigeration spaces clean, at 2-8 dgr. Celsius.  
Transport: clean, dry covered vehicles, at 8-12 dgr. Celsius.  
Consumption indications: it can be consumed by all consumer categories, which do not have allergies or medical contraindications regarding the product's components.

*Cream of yoghurt product paper*

Made from: cow milk;  
Types: fat;  
Organoleptic and physic-chemical characteristics:

Characteristics	Easy
Aspect and consistency:	Thinner consistence, without zer-eliminating gas bubbles
Color:	White, milk color or a slightly yellow tint
Smell and taste	Yoghurt specific, pleasant, bitter-sweet, without foreign taste or smell (sour, moldy).
Fat, %, minimum	2.8
Dry substance, %, minimum	8.5
Acidity, dgr. T	75 - 140
Proteic substances, %, minimum	7
Delivery temperature, dgr.C, maximum	8
Whey, %, maximum	0.5

Quality control, marking, storage, transport:  
Lot establishment: lot = max 5000 kg, yoghurt of the same type, package, presented at the same time at verifying.  
Packaging: 900g PET bottle.  
Marking: marking or labeling with: factory brand, product name, type or fat content, net weight, expiration date, fabrication standard.  
Storage: clean refrigeration spaces clean, at 2-8 dgr. Celsius.  
Transport: clean, dry covered vehicles, at 8-12 dgr. Celsius  
Consumption indications: it can be consumed by all consumer categories, which do not have allergies or medical contraindications regarding the product's components.

QFD method was selected as an instrument for planning and development of the quality functions in conformity with de quality characteristics expected by customers and to permit the achievement of this project.

Having in view to develop the methodology, there was formed a multidisciplinary team, whose members are involved in the departments of production-quality, acquisition and marketing/commercial.

In a first stage, an inquest was developed in order to establish the functions of the three products from the “yoghurt” family of products, expected by the customers and their importance, based on a questionnaire, containing the following questions:

1. Do you know the products offered by S.C. ELDA MEC S.R.L.?
2. If the answer is” Yes”, name three products.
3. Which is/are the products that you frequently buy?
4. Which are the characteristics you appreciate for the three products named above?
5. Do you buy/use the yoghurt from the S.C. ELDA MEC S.R.L.?
6. If “Yes”, which kind of yoghurt and which are the characteristics of item selected?

The objective of this team is to discover which are the quality characteristics of the products from the “yoghurt” category which respond better to the customer’s expectations, in order to be sustained and developed in the benefit of the clients.

Taking into account the consumers of the firm’s products opinion, it was observed the following correlation between the function and characteristics of products:

- The “nutritive” function was associated with the characteristics: *content of fat and content of proteins*;
- The “sensorial” function – with the characteristics: *appearance, firmness, smell and taste*;
- The “hygienically-sanitary” function: *temperature at distribution and the presence of foreign items*;
- The “aesthetic” function – associated with the *packaging system*;
- The “commercial” function – *trade mark and labelling system*.

Using the questionnaire it was identified the degree of importance of the requirements, granted by customers, with points from 1 – *low important* to 5 – *very important*, as follows:

Crt. No.	Needs (expectations) of the customers	Defined like	Points granted
1	Nutritional contribution	1. Content of fat % 2. Content of proteins %	5 3
2	Sensorial needs satisfaction	3. Appearance and firmness 4. Smell and taste	4 5
3	Safety in consumption	5. Temperature at distribution 6. Presence of foreign items	3 4
4	Comfort and commodity in use	7. Packaging system 8. Tightness	3 4
5	Information	9. Trade mark 10. Labelling	3 3

Table 2. Hierarchical values of the customers appreciations

The degree of covering the requirements through characteristics was evidenced with the relation matrix, with the following significance:

- \* - Very low cover (possible)
- o - Low
- # - Very strong

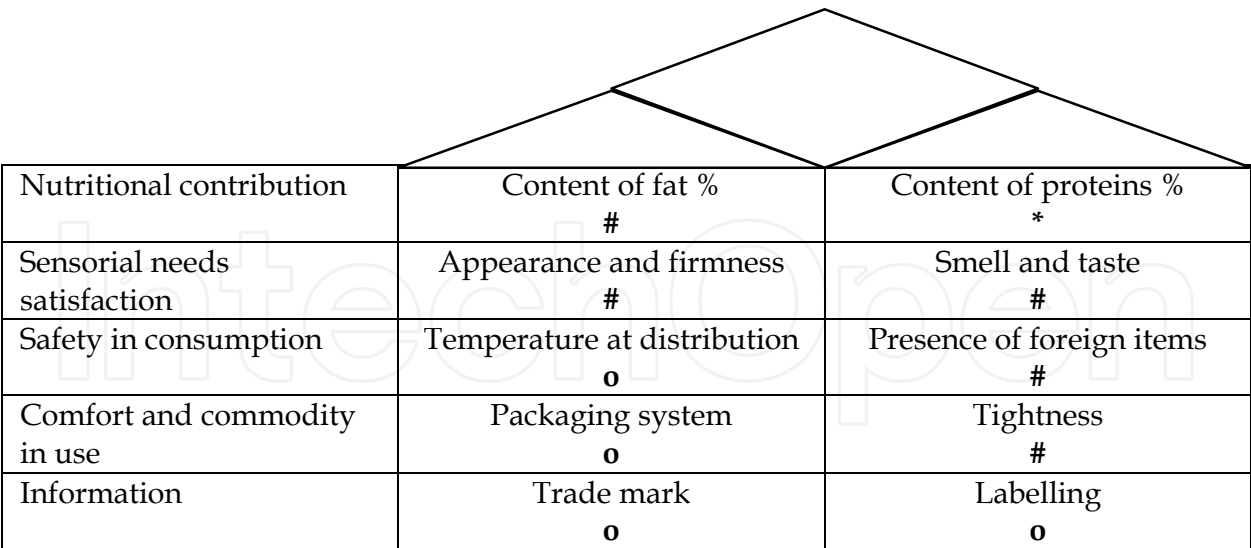


Fig. 4. The requirements cover matrix

Consequently to the definition and measurement of the consumers needs, the QFD team establishes that the respondents grant a major importance to the “fat content”, “appearance and firmness”, “tightness”, “presence of foreign items ” and “smell and taste”. That fact proves the necessity to sustain and develop further the product “Fat yoghurt”, otherwise, the product the best positioned on the market. The study demonstrated also the necessity to pay a greater attention to the trade mark and labelling systems.

Further on, the degree of correlation between the selected characteristics was evidenced in the correlation matrix.

The degree of correlation between the selected characteristics demonstrated by the QFD team that the majority of characteristics are sustained each other but it is necessary to improve the characteristics referring to the commodity and comfort in use, respectively the shape of the package, temperature at distribution, trade mark, labelling and the possibility to correlate the ratio price/quantity.

Taking into account the result after the consumer’s investigation, the QFD team proposed the realization of a new package with improved characteristics that consequently assured a significant growth of sales for the analysed products, especially for the article “fat yoghurt”.

4. Conclusions

Firms from all domains face the difficulty due to the modification more and more rapid of the requirements and expectations of the customers which vary significantly also between the different market shares.

The technical progress, the more and more important complexity of the production and the greater and greater pressure of innovation represent only several of the requirements in increasement that firms face.

QFD must contribute to the effective and efficient transformation of the customer’s requirements in the capabilities specific for a firm.

QFD method could be used everywhere the customers requirements (internal or external customers) must be transformed in specific capabilities for the firm, like in development/engineering, production or logistics.

In order to understand the QFD philosophy is supposed the basic knowledge of the quality management. In this way are enabling those who intend to become initiated in taking decisions: if QFD must be introduced and where precisely and which would be the successful procedure.

The mixed presentation of the concepts, principles and examples stimulate the understanding of the method and clarify the fact that QFD could be used in the consumption of goods area, in investments and even in the services one. To ensure the success of application is recommended a pilot-project with the assistance of an experienced moderator. The quality development must be sustained from the beginning till the use (products or services), intermediated by the clients. That means the definition, development, building, distribution, installation and if necessary some added services provided in order not only to satisfy but delight the customer also.

The chance to survive in competition is conditioned by the acceptance of the transformation. Nowadays firms must apply methods and procedures in order to develop and plan in conformity with the customers requirements. As a quality development method, QFD is oriented to the customer and involve the management in the orientation towards the consumer's process.

Orientation towards consumers is at the moment crucial for all the firms. But for all firms that the customer's requirements are continuously changing, faster and faster and the importance for different groups vary quite important.

For SME's an efficient and certified quality system in conformity with the international standards represents a real chance to survive in competition. Thus, the little business could be enabled to:

- Satisfy a necessity or accomplish a well defined objective (customer satisfaction);
- Produce in conformity with standards and specifications;
- Comply with the environment exigencies;
- Obtain competitive prices;
- Obtain benefit.
- With these purposes, the firm must:
- Understand, know and evaluate all the requirements, expectations and necessities of the potential customer;
- Design the quality of products and services;
- Achieve the quality of all processes, products and services in conformity with the initial project;
- Evaluate permanently the satisfaction degree for all the real customer;
- Assure a post-sale assistance, suitable for all customers.

As in all these stages could appear gaps, generating unconformities – non quality – it must be prevented or eliminated by correction.

In this manner could be contradicted the prejudice very speed that the quality costs (control, evaluation, correction). In fact, costs of the non quality, a well done job from the beginning and prevention permit the obtainance of quality with minimal costs.

## 5. References

- Akao, Y., Kogure, M., Yasushi, F. (1983). Seminar on Company – Wide Quality Control and Quality Deployment. October 31 – November 3, 1983, the Arlington Park Hilton, Chicago. Sponsored by the Cambridge Corporation and c-sponsored by ASQC
- Akao, Y. (1997). QFD: Past, Present, and Future; *International Symposium on QFD 97* – Linkoping,  
[http://stat.haifa.ac.il/~quality-study/4306/ReadingMaterial/QFD\\_History.pdf](http://stat.haifa.ac.il/~quality-study/4306/ReadingMaterial/QFD_History.pdf)
- Baloiu, L.M., Frasinianu, I. (2001). *Gestiunea inovatiei*, Economica Editure, ISBN: 973-590-542-6, Bucuresti, Romania
- Condrea E., Stanciu A. (May 2006). QFD Method, in *Tribuna Economica Magazine* nr.5/2006, ISSN 1018-0451, pp.56-57, 2 pg., Bucuresti, Romania
- Condrea, E., Stanciu, A.C. (2008). *Quality Management*, Lumina Collection, Libertatea Panciova Editure - Novi Sad, Serbia, ISBN 86-7001-166-2, Printed by SC INFCON SA Constanta, Romania
- Condrea E., Aivaz K.A., Muhcină S., Nicodim L. (2008). New Evaluation Instruments on the Quality Management System, Conferința internațională TEHNONAV 2008. *The 6th edition of the International Conference on Naval and Mechanical Engineering – New technologies for future clean mobility and environment*, organized by the Faculty of Mechanical Engineering, „Ovidius” University Constanța, 22-24 mai 2008. The paper was publicly presented at *Materials technologies and production management* and published in the volume *TEHNONAV 2008. The 6th edition of the International Conference on Naval and Mechanical Engineering – New technologies for future clean mobility and environment*, Ovidius University Press 2008, ISBN 978-973-614-447-9, pp.579-583, 5 pg., Constanta, Romania
- Evans, J.R. and Lindsay, W.M. (2005). *The Management and Control of Quality*, Sixth Edition, ISBN-13: 978-032-420-223-6, Ohio: South-Western
- Olaru, M., Isaic-Maniu, Al., Lefter, V., Pop, A.N., Popescu, S., Dragulanescu, N., Roncea, L., Roncea, C. (2000). *Techniques and instruments used in quality management*, Economica Editure, ISBN 973-590-256-7, Bucuresti, Romania
- ReVelle, J.B., Moran, J.W., Cox, C.A. (1998). *The QFD Handbook*, John Willey & Sons, ISBN 047-117-381-9, New York, USA
- Shigeru, M. and Akao, Y. (1978). *Quality Function Deployment: Company Wide Quality Approach* (in Japanese), JUSE Press
- Shillito, M.L. (1994). *Advanced QFD: Linking Technology to Market and Company Needs*, Wiley-Interscience, ISBN 978-047-103-377-6, New York, USA
- Shillito, M.L. (2000). *Acquiring, Processing, and Deploying: Voice of the Customer*, CRC Press, ISBN 978-157-444-290-8
- Terninko, J. (1997). *Step-by-step QFD (Quality Function Deployment): Customer Driven Product Design*, CRC Press, ISBN978-157-444-110-9

Vachette, J.E. (1990). Amélioration continue de la Qualité, Editeur d'Or, ISBN 270-811-151-5, Paris, France

IntechOpen

IntechOpen





## **Quality Assurance and Management**

Edited by Prof. Mehmet Savsar

ISBN 978-953-51-0378-3

Hard cover, 424 pages

**Publisher** InTech

**Published online** 23, March, 2012

**Published in print edition** March, 2012

The purpose of this book is to present new concepts, state-of-the-art techniques and advances in quality related research. Novel ideas and current developments in the field of quality assurance and related topics are presented in different chapters, which are organized according to application areas. Initial chapters present basic ideas and historical perspectives on quality, while subsequent chapters present quality assurance applications in education, healthcare, medicine, software development, service industry, and other technical areas. This book is a valuable contribution to the literature in the field of quality assurance and quality management. The primary target audience for the book includes students, researchers, quality engineers, production and process managers, and professionals who are interested in quality assurance and related areas.

### **How to reference**

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Elena Condrea, Anca Cristina Stanciu and Kamer Ainur Aivaz (2012). The Use of Quality Function Deployment in the Implementation of the Quality Management System, Quality Assurance and Management, Prof. Mehmet Savsar (Ed.), ISBN: 978-953-51-0378-3, InTech, Available from: <http://www.intechopen.com/books/quality-assurance-and-management/the-use-of-quality-function-deployment-in-the-implementation-of-the-quality-management-system>

**INTECH**  
open science | open minds

### **InTech Europe**

University Campus STeP Ri  
Slavka Krautzeka 83/A  
51000 Rijeka, Croatia  
Phone: +385 (51) 770 447  
Fax: +385 (51) 686 166  
[www.intechopen.com](http://www.intechopen.com)

### **InTech China**

Unit 405, Office Block, Hotel Equatorial Shanghai  
No.65, Yan An Road (West), Shanghai, 200040, China  
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元  
Phone: +86-21-62489820  
Fax: +86-21-62489821



© 2012 The Author(s). Licensee IntechOpen. This is an open access article distributed under the terms of the [Creative Commons Attribution 3.0 License](https://creativecommons.org/licenses/by/3.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

IntechOpen

IntechOpen