QFD IMPLEMENTATION IN COSMETIC SECTOR

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Approval of the Graduate School of Social Sciences

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for the degree of Master of Science/Doctor of Philosophy.

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ABSTRACT

QFD IMPLEMENTATION IN COSMETIC SECTOR

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This thesis was conducted to analyze the appropriateness of Quality Function Deployment implementations in Cosmetic sector. This study examines quality, products and service design concepts. In this study, the cosmetic sector in Izmir was examined to find customer requirements. To this end an inquiry has been made and data were analyzed by the help of SPSS software. I tried to emphasize the easiness of this method for medium scale companies in cosmetic sector.

This thesis consists of three parts. In introduction part, the present situation of cosmetic sector in Izmir was examined. I tried to show intensive competition on the market and results of this competition. In the first chapter, I tried to explain quality concept. In order to understand Quality Function Deployment philosophy, quality concept should be explained without a gap. In the second chapter, Total Quality Management and Quality function deployment were explained. To this end

customer oriented method, Total Quality Management concept was examined to understand important of design according to customer requirements. In the third chapter, Quality Function Deployment implementation was performed. End of the study Quality Function Deployment used to make a decision for required changes on design characteristics.

Key words: Quality Function Deployment (QFD), Total Quality Management (TQM), Design Characteristics, Customer Requirements.

ÖZET

KOZMETİK SEKTÖRDE
KALİTE FONKSİYON GÖÇERİMİNİN
UYGULAMASI

Neslihan Akınay Anıl
İşletme Yüksek Lisans Programı, İşletme Yönetim Bölümü

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Ocak 2007,105 sayfa

Bu tez Kalite Fonksiyon Göçeriminin kozmetik sektöründeki kullanımının uygunluğunu analiz etmek için yapılmıştır. Bu çalışmada, İzmir'deki kozmetik sektörü müşteri isteklerini bulmak için incelenmiştir. Bu amaçla bir anket yapıldı ve veriler SPSS programı ile analiz edildi. Bu metodun kozmetik sektöründeki orta ölçekli firmalar için kolay olduğunu vurgulamaya çalıştım

Bu çalışma üç bölümden oluşmaktadır. Giriş bölümünde İzmir'deki kozmetik sektörünün şu andaki durumu incelendi. Marketteki yoğun rekabeti ve bu rekabetin marketteki sonuçlarını göstermeye çalıştım. İlk bölümde, kalite kavramını açıkladım Kalite Fonksiyon Göçeriminin felsefesini anlamak için kalite kavramının boşluk olmadan açıklanması gerekli. İkinci bölümde, Toplam Kalite Yönetimi ve Kalite Fonksiyon Göçerimi anlatıldı. Bu amaçla müşteri odaklı Toplam Kalite Yönetimi

müşteri isteklerine göre tasarımın önemini anlamak için incelendi. Üçüncü Bölümde, Kalite Fonksiyon Göçerimi uygulaması yapıldı. Çalışmanın sonunda gereken teknik özelliklerin değişmesi kararı için Kalite Fonksiyon Göçerimi kullanıldı.

Anahtar Kelimeler: Kalite Fonksiyon Göçerimi, Toplam Kalite Yönetimi, Teknik Özellikler, Müşteri İstekleri

To my Grandmother, Nazmiye Aykar

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1. INTRODUCTION

Beauty and care were revealed together with the existence of the woman. During the history of humanity, beautiful women's legends and their beauty formulas had been told. After the Industrial Revolution, cosmetic industry replaced beauty formulas. In the Ottoman Empire, only royal women could use natural cosmetics. After establishing the Republic, society has started to care their appearance. Today cosmetic market is about 2 Million $ in Turkey, whereas the total cosmetic market is 200 Million $ in Globe. (Tümer Atatürk Hedef Alliance A.Ş. Director). When the amount is compared with the developing countries, it is clear that 2 million $ is an inadequate number. Marketers usually divided consumers in to three groups. Marketers called "A class consumer" who spend much more than other classes. "A class consumers" are richer than others. "C class consumers" spend the least. "B class consumers" are between "A and C class consumers". Beside A and B class consumers, in Turkey, people do not use cosmetics as frequently as people use it in Europe and the United States. Probably that is why; there is not a reputable Turkish cosmetic brand. Nearly all the products are imported. Local firms import and distribute famous brands (Başlangıç, 2004, pg 2). For instance, shampoo consumption in Turkey is % 20 of the consumption in Europe. In Europe % 79 of 15-40 years old women use make-up products whereas in Turkey this percentage is %2. That is why Turkey and Middle Eastern countries are seen as good markets. In the cosmetic industry, competition is very intense (Kabacaoğlu, 2005).

Sector is separated into two groups as cosmetics and derma-cosmetics. However the market is not matured, there are too many brands and products which are similar in terms of product portfolio and positioning. This cause low profit margins and price competition. Cosmetics industry is tending to derma-cosmetics. Pharmacy channel is a new distribution channel. Some brands are sold only in pharmacies. There are too many similar product in the market and this forces companies to find new features and product in order not to not lose their market share and competition abilities. Because of similar products, consumers decide on which product to buy by the help of price comparison. To be rescued, companies have to differentiate their products and their positioning. It is really vital to discover what really consumers need and want. How much is the designed product, demanded by the customers. The key point is the mentioned and unmentioned needs and demands of the customers.

RE&DE (Research and Development) departments of companies should discover these mentioned needs and wants and develop new products according to these needs and wants. Which features of the product will be developed and how will be they developed? To find these answers companies have a new weapon which is called QFD (Quality Function Deployment).

QFD can strongly help an organization focus on the critical characteristics of a new or existing product or service from the separate viewpoints of the customer market segments, company, or technology-development needs.

(http://en.wikipedia.org/wiki/Quality_function_deployment)

Design of customer oriented products and services are becoming a very common issue recently. It is obvious that sales of a product is designed according to the voice of customer are remarkably high. Low cost and high sales volume means increasing profit. That is why companies should consider customer needs and design their products according to the requirements of the customers.

Quality is an important competitive tool and an important strategy for the product. In order to keep up with the changing business environment and competitive strategies, companies should increase quality of their products and services. When it comes to talk about the product or the service, production in time and delivery, satisfying customer needs and wants, service ability, reasonable cost are recurred at first as important quality characteristics.

QFD is a flexible and comprehensive group decision making technique used in product or service development, brand marketing, and product management (http://en.wikipedia.org/wiki/Quality_function_deployment).

In today's business environment, production processes are changing as rapidly as products. Every day many new brands and products penetrate the market. And many of them are disappeared because of the lack of competitive advantage. QFD is applied in the early stages of the design phase so that the customer wants are incorporated into the final product.

Sometimes QFD is applied as to develop the existing product and eventually expand the product's life curve. Furthermore it can be used as a planning tool as it identifies the most important areas in which the effort should be focused on our technical capabilities.

The main purpose of this research is to show that QFD is an efficient tool in the cosmetic market. QFD method is a very effective way to understand the customers in a big market like Turkey and present the correct products to those customers. For this reason I suggest that it would be useful to analyze the main topics of QFD, which are namely: design and wants of customers.

2. QUALITY IN TERMS OF CONSUMER AND MANUFACTURER

Quality is generally transparent when present, but easily recognized when absent (Xie and Chia, 1998, pg 634). Before determining what quality is for customers, we should first analyze which concepts the companies internalize while they are presenting the product and the service to the customers. By this way we can see the problems more apparently and discover how important it is to design the product and the service according to the customer.

Selling a product turned into marketing in the course of time. This evolution happened with the development of the business concepts. There are five concepts under which organizations conduct their marketing activities:

The production concept holds that consumers will favor products that are available and highly affordable. Therefore, management should focus on improving production and distribution efficiency. This concept is one of the oldest orientations that guide sellers. The production concept is still a useful philosophy in two types of situations. The first occurs when the demand for a product exceeds the supply. Here management should look for ways to increase production. The second situation occurs when the product's cost is too high and improved productivity is needed to bring it down. Although useful in some situations, the production concept can lead

to marketing myopia (Kotler and Anstrong, 2003, pg 12). Companies adopting this orientation run a major risk of focusing too narrowly on their own operations and loosing sight of the real objective-satisfying customer's need.

The product concept holds that consumers will favor products that offer the most in quality, performance, and innovative features. Thus an organization should devote energy to making continuous product improvements. Some manufacturers believe that if they can build a better mousetrap, the world will beat a path to their door. But they are often shocked. Furthermore a better mousetrap will not sell unless the manufacturer designs, packages, and prices it attractively, places it in convenient distribution channels; brings it to the attention of people who need it; and convinces buyers that it is a better product. Thus the product concept can also lead to marketing myopia. Kodak assumed that consumers wanted photographic film rather than a way to capture and share memories and at first over-looked the challenge of digital cameras. Although it now leads the digital camera market in sale, it has yet to make significant profits from this business. RAKS and IBM companies can be good examples for this kind of marketing myopia (Kotler and Anstrong, 2003, pg 12).

Many companies follow ***the selling concept***, which holds that consumers will not buy enough of the firm's products unless it undertakes a large-scale selling and promotion effort. The concept is typically practiced with unsought goods-those that buyers do not normally think of buying, such as

insurance or blood donation. These industries must be good at tracking down prospects and selling them on product benefits. Most firms practice the selling concept when they face overcapacity. Their aim is to sell what they make rather than make what the market wants. Such marketing carries risk. It focuses on creating sales transactions rather than building long-term profitable customer relationships. It is assumed that customers who are coaxed into buying the product will like it. Or, if they do not like it, they will possibly forget their disappointment and buy it again later. These are usually poor assumptions. Mostly studies show that dissatisfied customers do not buy again. Worse yet, whereas the average satisfied customer tells three others about good experiences, the average dissatisfied customer tells ten others about his or her bad experiences.

The marketing concept holds that achieving organizational goals depends on knowing the needs and wants of target markets and delivering the desired satisfactions better than competitors do. Under the marketing concept, customers focus and value the paths to sale and profits. Instead of product centered “make and sell” philosophy, the marketing concept is a customer centered “sense and respond” philosophy. The job is not to find the right customers for your product, but the right product for your customer (Kotler and Anstrong, 2003, pg 12). QFD is a technique to find right product for target customers.

It is clearly followed above that if the companies ignore the needs and wants of the customer and design the product or service likewise, serious problems are to occur. How to present product and service to the customer

is a problem that holds strategic importance. If a company designs and presents a state of the art to the market, it does not necessarily mean that the product is going to achieve perfect success and get the competitive advantage. If the customer cannot use this product easily, if the product is expensive and if the customer does not need the technology the product provides; this state of the art in your hand is nothing but trash.

Customer value is the differences between the values the customers gain from owning and using a product and the costs of obtaining it. Customer expectations are based on previous buying experiences, the opinions of friends, seller and competitor information and promises. Customer satisfaction with a purchase depends on how well the product's performance keeps up with the customer's expectations. Customer satisfaction is the key factor for QFD and Total Quality Management.

According to which criteria does the customer think the product and the service is good quality? Which features does the customer seek in the service and the product? Even more importantly; what is quality? From this point of view I will try to identify quality.

2.1 QUALITY

As mentioned above; rather than the company's perception of quality, customer's perception of quality is much more important. For this reason, a group that is going to lead QFD study should first find an answer to the question; what do customers really want? After this, the group should

discover what kind of a product or service satisfies the target customers want and by doing so the QFD application would be easier to apply and it would give correct results.

Quality has emerged and remained as a dominant theme in management thinking since the 1940s. While the initial approaches emerged from American theorist practitioners, early commercial applications were predominantly amongst Japanese companies. The need for enhanced quality was largely ignored or rejected in the west. More recently organizations throughout the world have begun to embrace the theories and practices (Beckford, 2000, pg 1). During the post-World War Two years, consumers' demand grew to such an extent that the manufacturing focus in the western world swapped on productivity. Effectively growing markets were starved of products and with increasing economic prosperity; everything that could be produced could be sold. Simply with unfulfilled demand, organizations were under no pressure to focus on the quality of product and perhaps perceived that they had already achieved the ultimate standards. Coupling this, consumer expectations of product life and reliability were relatively low compared with today as was the technology of both the products and the manufacturing process. (Beckford, 2000, pg 4)

Price determining mechanism can behave more freely in monopolistic markets. But nowadays such monopolistic markets are rare. We observe that competition rapidly grows in free market economy. With the rapid growth of technology, every kind of innovation can be immediately copied by other companies. This also decreases the competitive advantage of the

enterprises. As it is the situation, companies try to obtain competitive advantage in the issues like price delivery timing and quality.
According to John Beckford, companies use three different ways to obtain competitive advantage.

As markets matured and growth consequently stabilized, organizations, faced with increasing cost of production began to challenge their established ways of working. Some organizations further increased the pressure on workers for more productivity gains while pursuing cost reductions in raw materials and through research and developments, others relied on the emerging technologies of automation, robotics and electronic data processing; most adopted a mix of these approaches. (Beckford, 2000, pg 4)

It is apparent that the companies that follow the second way are going to be more successful and long term. The managers who oppress their employees in an aggressive attitude should know that to produce quality products and to manage all the company activities perfectly, the employees should trust the company and they should be fully motivated. Quality does not only mean producing quality products. The production process, working conditions, the employees and the employers of the company; all should be over a certain quality level. Since, no matter how quality seems to be a feature of the product, it actually is a team work. For this very reason, the production unit and all the other units should follow the innovations and should use the modern techniques of Business Administration on the new product designing processes.

Quality is a lot more subjective than how the customers perceive the product or the service. Everybody tries to determine quality according to their “quality product".

According to John Beckford, in business and management terms there is an attempt to focus on a measurable concept of quality by concentrating on “fitness for purpose”. A specification is supplied by the customer and the quality of the product is measured by how closely it conforms to this specification. It is based on the customer’s perception of quality (Hannagan, 1998, pg 172). In more general terms, quality is an elusive concept and the usual dictionary definition does not help to make it less so. The quality of a person may be measured by certain characteristics, such as honesty and courage (Hannagan, 1998, pg 172).

Quality, the way we have defined it as meeting the customers’ requirements, gives people in different functions of an organization a common language for improvement. It enables all the people with different abilities and priorities, to communicate readily with one another, in pursuit of common goal. When business and industry were local, the craftsman could manage more or less own his own. Business is now so complex and employs so many different specialist skills that every one has top rely on the activities of others in doing their jobs. (Oakland, 2000, pg 15)

I think quality is what a customer gets more than he has accepted to pay for the service or the product. More openly, the satisfaction of the customer

who has received more than the standards he has accepted to receive would be more than expected. This means the product has got more performance than what is expected of it, and eventually it is high quality. For example, if a customer buys a 5 mega pixels digital camera which is for the price of a 3mega pixels digital camera, that camera's quality is rated very well. However, if the customer finds a 1mega pixel digital camera in his hand when he has already paid for a 3mega pixels digital camera, the customer will think that brand of digital camera is not of high quality. I received an e-mail. This e-mail had a funny approach to perceptions of the customer and the company. That mail is written below.

The one who says 9 women can give birth to a baby in one month is called PROJECT MANAGER.

The one who says one baby can be hardly born in 18 months is called PRODUCTION MANAGER.

The one who says one woman can give birth to 9 babies in one month is called PLANNING MANAGER.

The one who says the way baby is produced is certainly wrong is called QUALITY MANAGER.

The one who says even if there were no men and women on earth, the baby would reproduce itself is called MARKETING MANAGER.

The one who expects a woman to give birth to a baby in a month is called GENERAL MANAGER.

The one who says he does not want a baby at all is called the CUSTOMER

As followed above in the text, unless the products and services are prepared according to target audience, all the effort and expenses are nothing but trash.

2.1.1 DIMENSIONS OF QUALITY

Companies' approach to quality is different from customers' approach. What is the quality in the eye of the customer? As I mentioned before, quality is not an objective matter. Products and services are designed with international differences in quality to meet the different wants and needs to individual consumers. That means companies should take into considerations the quality in the eye of the customers. Usually quality is defined as in 9 dimensions. A consumer looks for in a product included some dimensions.

1. ***Performance:*** the basic operating characteristics, such as a washing machine's cleaning ability.
2. ***Features :*** the extra items added to the basic features, such as cruise control in a car

3. ***Reliability:*** probability that the product will continue functioning without any significant maintenance.
4. ***Conformance:*** degree to which a product meets standards. When a customer buys a product out of the warehouse, it should perform identically to that viewed on the showroom floor.
5. ***Durability:*** number of years of service a customer can expect from a product before it significantly deteriorates. Differs from reliability in that a product can be durable but still need a lot of maintenance.
6. ***Serviceability:*** the ease of getting repairs. The speed of repairs.
7. ***Aesthetics:*** how a product looks, feels, sounds, tastes, or smells.
8. ***Perceived quality:*** product's over all reputation. Especially important if there are no objectives, easily used measures of quality (Wheelen and Hunger, 2006, pg 151).
9. ***Other perceptions:*** subjective perceptions based on brand name, advertising and the like (Russell and Taylor, 2002, pg 615)

Service quality is more directly related to time, and the interaction between employees and the customer Evans and Lindsay identify the following dimensions of service quality.

1. ***Time and timeliness:*** how long a customer must wait for service and if it is completed on time.
2. ***Completeness:*** is every thing the customer asked for provided?
3. ***Courtesy:*** how customers are treated by employees.
4. ***Consistency:*** is the same level of service provided to each customer each time

5. ***Accessibility and convenience:*** how easy it is to obtain the service.
6. ***Accuracy:*** is the service performed right every time
7. ***Responsiveness:*** how well the company reacts to unusual situations, which can happen frequently in a service company. (Evans and Lindsay, 1996)

Because one product has got more than one feature, customers compare the rival products' quality according to this. According to customer perceptions, some companies, products or services have superior quality when compared with others. When giving a decision customers mostly compare products of different companies in terms of many characteristics. Perceptual map is a visual method of comparing customer perceptions of different products or services. Consider the perceptual map of breakfast cereals in terms of taste and nutrition shown in Figure 1. The lack of an entry in the good-taste, high-nutrition category suggests there are opportunities for this kind of cereal in the market. Perceptual maps are frequently used to compare rival products in two features. So it is easier to observe where the products stand in relation with each other. This comparison, while not giving enough information about the product to the customers, provides crucial data.

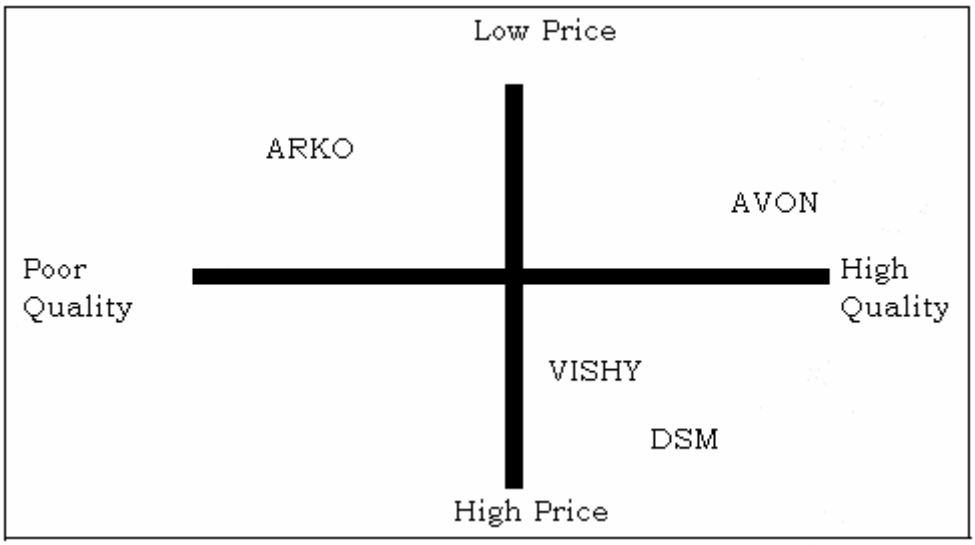

Figure 1. Perceptual map

Benchmarking (also "best practice benchmarking" or "process benchmarking") is a process used in management and particularly strategic management, in which organizations evaluate various aspects of their processes in relation to best practice, usually within their own sector. This then allows organizations to develop plans on how to adopt such best practice, usually with the aim of increasing some aspect of performance. Benchmarking may be a one-off event, but is often treated as a continuous process in which organizations continually seek to challenge their practices. Benchmarking is a powerful management tool because it overcomes "paradigm blindness." Paradigm Blindness can be summed up as the mode of thinking, "The way we do it is the best because this is the way we've always done it." Benchmarking opens organizations to new methods, ideas and tools to improve their effectiveness. It helps crack through resistance to change by demonstrating other methods of solving problems than the one currently employed, and demonstrating that they work, because they are being used by others. (http://en.wikipedia.org/wiki/Benchmarking)

One of the biggest mistakes that the companies make is that they evaluate their own sales only, but not the whole market and place themselves accordingly in the market. Even if the customers buy the product, they may not perceive the product as good quality. Apparently, when a new, high quality product with the same cost penetrates the market, the sales are going to swap to the new product. For this reason, even if everything seems to be going right, the companies should try to upgrade themselves against their rivals by using benchmarking methods.

3. TOTAL QUALITY MANAGEMENT AND QUALITY FUNCTION DEPLOYMENT

3.1 TOTAL QUALITY MANAGEMENT (TQM)

In the previous chapter, we underlined that quality is more than producing high quality product. TQM is an approach to improve the competitiveness, effectiveness and flexibility of a whole organization. It is essentially a way of planning, organizing and understanding each activity and depends on each individual at each level. For an organization to be truly effective, each part of it must work properly together towards the same goals, recognizing that each person and each activity affects and in turn is affected by others. TQM is also a way of ridding people's lives of wasted effort by bringing everyone in to the process of improvement, so that results are achieved in less time. The methods and techniques used in TQM can be applied throughout any

organization. They are equally useful in the manufacturing, public service, health care, education and hospitality industries.

Tim Hannagan described Total quality management as a value-based approach to quality management; it may be seen either as a goal which an organization aims to achieve, or the idea of a goal of total quality may be considered unattainable. On the other hand, total quality management can be described as both systematic and value based. It can be seen to suggest that the reason for improving quality is that it will have maximum strategic impact on the future of the organization. Total quality management is designed as a practical and pragmatic framework in which derives towards quality improvement can be sustained while not making claims on total quality. (Hannagan, 1998, pg 174)

In an organization that practices total quality management, TQM is a method that is practiced in a company which internalizes the quality. The companies start to apply that method at level of providing the necessary combinations for product or the service and continue even after the customer uses the product or the service. Good service providing is a task for the companies that have internalized TQM.

It is not simply a program or project, but a way of life. It is proved by the quality of materials purchased from supplier, that approach to defect control on the production line, the appearance of the building, the way problems are solved for customers, the way employees and organization's internal communication system are organized.

This approach is founded on the premise that quality depends on individuals' efforts and attitudes. It is a rigorous, highly disciplined and skilled process which may challenge present practice and depends on a training program throughout the organization. Total quality management is predicated on a commitment to customer interests, needs, requirements and expectations, and on the commitment of everyone to the constant improvement of the quality of everything that the organization does and provides for its customer. (Oakland, 2000, pg 15)

Tim HANGAN explained the role of TQM in the management of a company. To be successful in promoting business efficiency and effectiveness, TQM must be truly organization-wide, and it must start at the top with the chief executive or equivalent. The most senior directors and management must all demonstrate that they are serious about quality. The middle management has a particularly important role to play, since they must not only grasp the principles of TQM they must go on to explain them to the people for whom they are responsible, and ensure that their own commitment is communicated. Only then will TQM spread effectively throughout the organization. This level of management also needs to ensure that the efforts and achievements of their subordinates obtain the recognition, attention and reward that they deserve. (Hannagan, 1998, pg174-177)

TQM emphasizes top management's role in leading a total quality effort on which all employees at all level must focus. All employees are

responsible for continuous quality improvement, and quality is the focal point of all organizational functions. The organization must decide what the customer wants in terms of quality and then use strategic planning encompassing all functional areas to achieve goals for quality (Russell and Taylor, 2002, pg 623).

The chief executive of an organization should accept the responsibility for a commitment to a quality policy in which s/he must really believe. This commitment is part of a broad approach extending well beyond the accepted formalities of the quality assurance function. It creates responsibilities for a chain of quality interactions between the marketing, design, production/operations, purchasing, distribution and service functions. Within each and every department of the organization at all levels, starting from the top, basic changes of attitude may be required to operate TQM. If the owners or directors of the organization do not recognize and accept their responsibilities for the initiation and operation of TQM then these changes will not happen. Controls, systems and techniques are very important in TQM, but they are not the primary requirements. It is more of an attitude of mind, based on pride in the job and team work, and it requires total commitment from the management, which must then be extended to all employees at all levels and in all departments.

TQM represents a set of management principles that focuses on quality improvement as the driving force in all functional areas and at all levels in a company. These principles were grouped by Roberta S. Russell & Bernard W. Taylor:

1. The customer defines quality and customer satisfaction is the top priority.
2. Top management must provide the leadership for quality.
3. Quality is a strategic issue, and requires a strategic plan.
4. Quality is the responsibility of all employees at all levels of the organization.
5. All functions of the company must focus on continuous quality improvement to achieve strategic goals.
6. Quality problems are solved through cooperation among employees and management.
7. Problem solving and continuous quality improvement use statistical quality control methods.
8. Training and education of all employees are the best basis for continuous quality improvement (Russell and Taylor, 2002, pg 623).

If management forces workers to accept quality as a requirement, this system will not be successful. Quality cannot be imposed to the employees and laborers as a requirement. It is a must that quality should become a company tradition and it is possible only in such an organization that TQM can be fully applied in the whole company. Entire company should see the quality as a discipline. Entire company should internalize quality objectives which are customer oriented. The chief executive of an organization should accept the responsibility for a commitment to a quality policy in which s/he must really believe. It is more an attitude of mind, based on pride on the job and team work, and it requires from the management total commitment, witch must then be extended to all employees at all levels and in all departments. There is no need for the management to oppress the

employees who have internalized quality within the company since they have internalized quality and developed their own auto control and they feel as much responsibility on the product's quality as the manager does. As the employees fulfill their duties perfectly, the managers can spare the time they have spent to inspect the employees for more useful tasks and projects. An important component of any TQM program is the company's ability to measure customer satisfaction. So that in a company that has internalize TQM customer satisfaction would be as important as it is for the marketing department and the employees would be aware that they work as to produce more quality products.

TQM has many tools which are used in different departments of the company. Traditionally, performance measures and indicators have been derived from cost accounting information, often based on outdated and arbitrary principals. These provide little motivation to support attempts to introduce TQM and, in some cases actually inhibit continuous improvement because they are unable to map process performance. In the organization that is to succeed over the long term, performance must begin to be measured by the improvements seen by the customer. (Oakland, 2000, pg 117-118)

Quality Function Deployment is one of these tools. Imagine designing products that assure customer satisfaction. Since 1966, QFD has been used world wide in nearly every industry and sector in order to

1. Prioritize spoken and unspoken customer wows, wants, and needs;

2. Translate these needs into actions and designs such as technical characteristics and specifications; and
3. Build and deliver a quality product or service by focusing various business functions toward achieving a common goal of customer satisfaction. (http://www.qfdi.org/what_is_qfd/what_is_qfd.htm)

According to Gleen Mazur QFD, one of TQM is the only comprehensive quality system aimed specifically at satisfying the customer. It concentrates on maximizing customer satisfaction by seeking out both spoken and unspoken needs. QFD translate these into actions and designs. Furthermore QFD allows customers to prioritize their requirements benchmarking against our competitors and then direct us to optimize those aspects of our product, service or process that will bring the greatest competitive advantage (Gleen Mazur: 2003 pg 1). According to Han and Sodhi, QFD is a structured approach to seek out customers and understand their needs (Han and Sodhi, 2001, pg 798).

3.2 QUALITY FUNCTION DEPLOYMENT (QFD)

3.2.1History of Quality Function Deployment

Before scrutinizing QFD in detail, I would like to tell its historical development process and design. Quality Function Deployment (QFD) was conceived in Japan in the late 1960s, during an era when Japanese industries broke from their post-World War II mode of product development through imitation and copying mode and moved to product development

based on originality. QFD was born in this environment as a method or concept for new product development under the umbrella of Total Quality Control. After World War II, statistical quality control (SQC) was introduced to Japan and became the central quality activity, primarily in the era of manufacturing. Later, it was integrated with the teachings of Dr. Juran, who during his 1945 visit to Japan emphasized the importance of making quality control a part of business management, and the teaching of Dr Kaoru Ishikawa, who spearheaded the Company Wide Quality Control movement by convincing the top management of companies of the importance of having every employee take part. This evolution was fortified also by the 1961 publication of Total Quality Control by Dr Feigenbaum. As a result, SQC was transformed into TQC in Japan during this transitional period between 1960 and 1965

It was during this time that Dr Yoji Akao first presented the concept and method of QFD. The Japanese automobile industry was in the midst of rapid growth, going through endless new product development and model changes. At that time, the following two issues became the seeds out of which QFD was conceived.

1. People started to recognize the importance of design quality, but how it could be done was not found.
2. Companies were already using QC process charts, but the charts were produced at the manufacturing site after the new products were being churned out of the line. (http://www.qfdi.org/what_is_qfd/history_of_qfd.htm)

The purpose of Professors Mizuno and Akao was to develop a quality assurance method that would design customer satisfaction into a product before it was manufactured. Prior quality control methods were primarily aimed at fixing a problem during or after manufacturing.

The first large scale application was presented in 1966 by Kiyotaka Oshiumi of Bridgestone Tire in Japan, which used process assurance used fishbone diagram to identify each customer requirement and to identify the design substitute quality characteristics and process factors needed to control and measure it.

In 1972, with the application of QFD to the design of an oil tanker at the Kobe Shipyards of Mitsubishi Heavy Industry, the fishbone diagrams grew unwieldy. Since the effects shared multiple causes, the fish bones could be refashioned into a spreadsheet or matrix format with the rows being desired effects of customer satisfaction and the columns being the controlling and measurable causes.

At the same time, Katsuyoshi Ishihara introduced the Value Engineering principles used to describe how a product and its components work. He expanded this to describe business functions necessary to assure the quality of the design process itself. Merged with these new ideas, QFD eventually became the comprehensive quality design system for both product and business process.

The first seminar (a 2 day seminar) in Japan was organized in 1983 by Japan Productivity Center, and was followed by many others. The introduction of QFD to America and Europe began in 1983 when the American Society for Quality Control published Akao's work in *Quality Progress* and Cambridge Research (today Kaizen Institute) invited Akao to give a QFD seminar in Chicago. This was followed by several QFD lectures to American audiences sponsored by Bob King and GOAL/QPC in Boston.

Today, QFD continues to inspire strong interest around the world, generating new application, practitioners and researchers each year. Countries that have held national and international QFD Symposium to this day include the U.S., Japan, Sweden, Germany, Australia, Brazil, and Turkey (http://www.qfdi.org/what_is_qfd/history_of_qfd.htm)

Dr. Akao is one of the few to receive the prestigious Deming Prize for Individuals as well as the Best on Quality Award from International Academy for Quality. He was also awarded the inaugural Distinguished Service Medal from the American Society for Quality. He is an author of many published articles and books including *Quality Function Deployment: Integrating Customer Requirements into Product Design* and *QFD: the Customer-Driven Approach to Quality Planning & Deployment.* Dr. Akao is chairman of the International Council for QFD and the senior advisor to the QFD Institute.

Two distinguished awards have been established in recent years in his honor. The Akao Prize® is awarded to individuals around the world who

have demonstrated Excellence in their practice and dissemination of QFD for many years (http://www.qfdi.org/what_is_qfd/history_of_ qfd.htm).

3.2.2 Design

Products, services and processes may be designed, both to add value to customers and to become more profitable. But leadership and management style is also designed, perhaps through internal communication methods and materials. Almost all areas of business have design issues within them. (Oakland, 2000, pg 36)

An organization can gain a competitive edge through designs that bring new ideas to the market quickly, do better job satisfying customer needs, or are easier to manufacture, use and repair than existing products and services (Russell and Taylor, 2002, pg 77). All products or services are needed to update periodically. This design process expand products life curve.

Slinger neatly proposes that “Quality Function Deployment is a design tool which is a powerful support to “encouraging” engineering design teams to take a structured, through approach to product design” (Slinger, 1992 pg 40). Marketing people, design engineers, and manufacturing staff will work closely together from the time a product is first conceived (Adiano, 1994, pg27)

According to Oakland, designing must take place in all aspects of:

- Identifying the need (including need for change)
- Developing that which satisfies the need
- Checking the conformance to the need
- Ensuring that the need is satisfied. (Oakland, 2000, pg 36)

Ginn and Zairi defined QFD as a system for translating customer requirements in to appropriate company requirements at each stage (of the product development cycle) from research and product development to engineering and manufacturing to marketing/sales and distribution (Ginn and Zairi, 2005, pg 39). The design process begins with understanding the customer and actively identifying customer needs.

There is a very important issue to notice before commencing a product's designing according to customer's wants and needs. This issue is the product's features. Are these criteria measurable and concrete? Will a change in these criteria fulfill the needs of the target audience? According to Kenneth Crow, the criteria for the technical characteristics are:

- **Global** - must not imply or constrain design alternatives to any one technical solution or approach
- **Meaningful** - must be subsequently actionable to drive the design process; they can't be abstract
- **Measurable** - must be able to define a target value and clearly determine whether the characteristic has been achieved or not (Crow, 2000, pg 1).

The technical features that are going to be changed should be analyzed with regards to these three criteria. Otherwise the team that will design the product or the service at design phase will encounter great difficulties.

Every product or service has got a life curve. When a product enters the market it attracts attention, but as time goes by it gets into maturity phase and soon new products replace the old ones. Thanks to design, it is possible to expand a product's life curve and maintain its market share in a long term. So the companies can use their competitive power for a longer time.

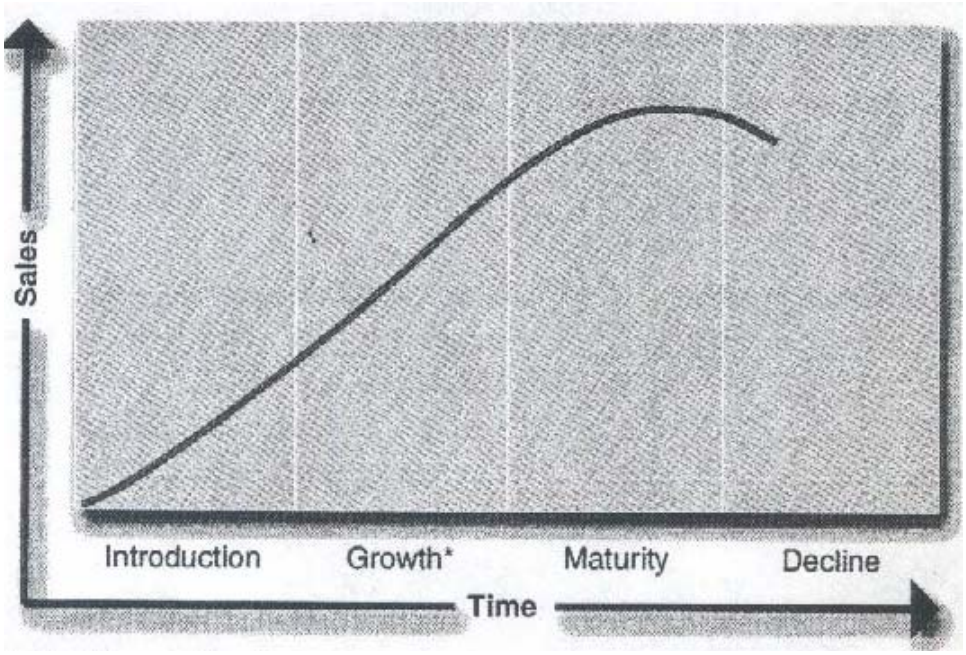

Figure 2. Life curve of a product or service (Kotler and Anstrong, 2003, pg 330)

To differentiate a product or service a company should design its product or service in accordance with the target market or target customers. Also

updated designs and products are very crucial in terms of life curve of products. When the product is in its maturity stage some actions should be taken in order not to loose its cash flow and market share. By expanding life curve, companies try to maintain their position in the market. In this case QFD Is a very useful tool which enables designers and companies expand their products or service life curve.

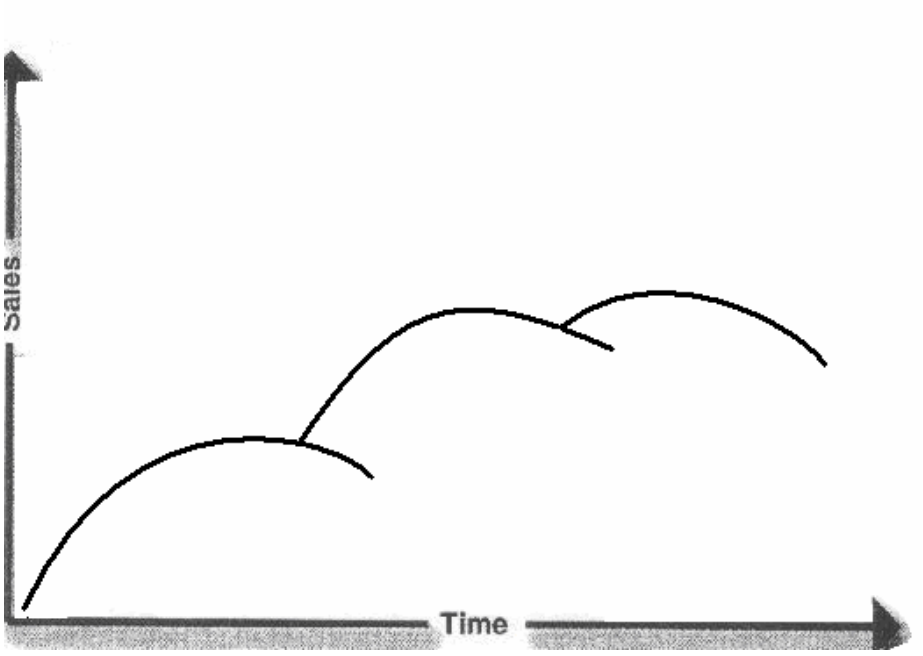

Figure 3. Life curve of modified or differentiated product or service

If we make the changes and the redevelopments demanded by the customer, the product or the service will survive in the market more and provide the company constant cash, as followed in the Figure 3. The most important question at that point is that, according to what we should make the redevelopments to prevent decline in the sales. So how can we find the answer to that question? How will we design our product? We can ask the same design question for the production as well. How is it possible to produce more quality products with lower costs? This question should be

answered to develop the process of design. According to Bouchereau, QFD provides the means for translating customer needs into appropriate technical requirements for each stage of a product/process development life-cycle(Bouchereau, 2000, pg 8)

Producing more quality products, presenting a product which the customer really needs and responding the market rapidly are some of the strategic issues that the companies try to achieve. Companies start to work on the issues by listening to the customers. It does not necessarily mean that if the product is the state of the art, there is no problem with it. The customer may be seeking a practical solution rather than a state of the art. At this point, the designer and engineer team and the marketing team should cooperate. First, what the customer wants should be clearly stated by asking the customers and then he engineers or designers should make a research on how they can respond the customers' needs and wants and design the product or the service accordingly. To realize this, we should first answer the question: what do customers really want?

3.2.3 What Do Customers Really Want?

According to Glenn Mazur, there are two problems often encountered in finding customer’s needs and wants. One is most consumers’ difficulty in expressing themselves in a focus group setting. The second problem is the issue of articulation problem. In this situation, they can tell you if they like or dislike something they have tried or are exposed to, but they have much

more difficulty telling you why. It is similar to the problem of taking a long car trip and later being asked to describe different points along the way. Unless you were looking for them, you will have difficulty recalling what you saw. Somewhat, opposite is the problem of describing a product response to a problem. Consumers might know that they have a problem or need but have difficulty in describing a new product that would solve or satisfy their need (Mazur, Rings and Barton, 1998, pg 2).

To satisfy customers, we need to understand how meeting their requirements effects satisfaction. The Kano Model provides insight into consumer needs that suggests a new approach for collecting consumer information. This model was developed in Japan and has been used by leading Japanese automobile and electronics companies to develop innovative products. The Kano model describes customer satisfaction in terms of Expected, Revealed and Exciting needs as shown in Figure 1 (Mazur, Rings and Barton, 1998, pg 3).

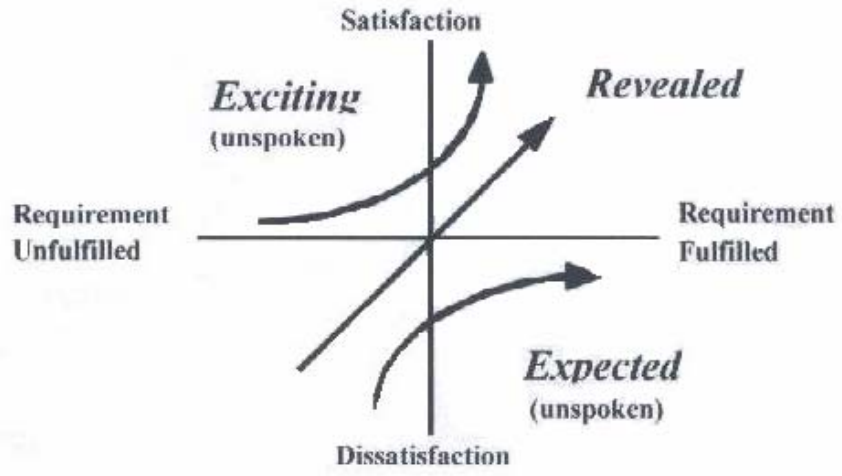

Figure 4. Customer satisfaction graph (Mazur, 1994, pg 3)

Expected Requirements are often so basic the customer may fail to mention them-until the company fail to deliver them. They are basic expectations of the service, without which the service may cease to be of value: their absence is very dissatisfying. Furthermore, these requirements often go unnoticed by most customers (GCC RIO Grande, 2002 pg 3). Expected needs are the most basic yet are often unspoken by the customer. For example, when one flies from Istanbul to Ankara, they expect their baggage to meet passengers at their final destination. Getting their baggage on time and in one piece is expected. But if they had an experience where they had lost some baggage, then they may not book their next flight (Mazur, Rings and Barton 1998 pg 2).

Revealed Requirements can be articulated better (Mazur, Rings and Barton, 1998, pg 3). These are typically what sales people are heard by just asking customers what they want. Fast service would be a good example (GCC RIO Grande, 2002, pg 3). This advantage however may be short-lived as competition notices their competitor's success and matches this performance. If enough competitors consistently achieve this level of performance, then the Revealed need turns in to an Expected need. Revealed needs are one-dimensional in that satisfaction increases (decreases) in direct proportion to the fulfillment of the need (Mazur, Rings and Barton 1998, pg 3).

Exciting Requirements are very difficult to discover. They are beyond the customer's expectations. Their absence does not dissatisfy their

presence excites (GCC RIO Grande, 2002, pg 3). They are unspoken so you cannot ask consumers to identify what they did not know they needed in the first place. If a company first identifies and delivers an Exciting need, then the company has an innovative product. An example of Exciting Requirement might be providing a way for passengers to plug in their lap top computers into a power source while in flight (Mazur, Rings and Barton 1998, pg 3).

Kano's model is also dynamic in that what excites today becomes expected tomorrow. That is once introduced an exciting service will soon be imitated by the competition and customers will come to expect it from everybody (GCC RIO Grande, 2002, pg 3).

In terms of expected requirements, there is little satisfaction or competitive advantage when nothing goes wrong. Conversely, great value can be gained by discovering and delivering on exciting requirements through the competition. QFD helps to assure that expected requirements do not fall through the cracks and point out the opportunities to build in excitement. (GCC RIO Grande, 2002, pg3).

Upon discovering what the customers really want and determining the exciting requirements that are going to provide strategically advantage to the company, how the product's characteristics are going to be determined according to the exciting requirements is the next issue to handle. This issue is sometimes easy. Sometimes a product may have lots of

characteristics. Changing one characteristic in order to fulfill a demand may ruin a completely different technical characteristic of the product. In today's market conditions, a product has got more than one characteristic and there is more than one customer in demand of this product.

QFD method offers great comfort to the designer and the company by the help of matrix that solves the problem systematically.

3.2.4 Quality Function Deployment for Product and Service

Quality must be designed into the product, not inspected into it. Quality can be defined as meeting customer needs and providing superior value. This focuses on satisfying the customer's needs, places an emphasis on techniques such as Quality Function Deployment to help understand those needs and plan a product to provide superior value (Crow, 2002 pg 1).

Quality Function Deployment is a flexible and comprehensive group decision making technique used in product, service or process deployment, brand marketing and product management. QFD can strongly help an organization focus on the critical characteristics of a new or existing product or service from the separate viewpoints of the customer market segment, company or technology development needs. QFD transforms customer needs/requirements in to engineering characteristics of a product or service, prioritizing each product/service characteristic while simultaneously setting development targets for product or service deployment. QFD is applied in wide variety of service, consumer products, military needs and emerging

technology products. The technique is also used to identify and document competitive marketing strategies and tactics. (www.wikipedia.org/wiki/ QFD)

Quality Function Deployment is a design system which designs products or service according to Voice of Customer. It translates customers' needs into technological or feature specifications. To reach perfect products means nothing but to reach exactly what customer needs and wants means everything. Mostly engineers make this mistake. They design a product which includes high technology, has perfect quality and aspect. This product can be perfect but too deer. On the other hand customers imagine a completely different product. As mentioned before exciting needs are unspoken.

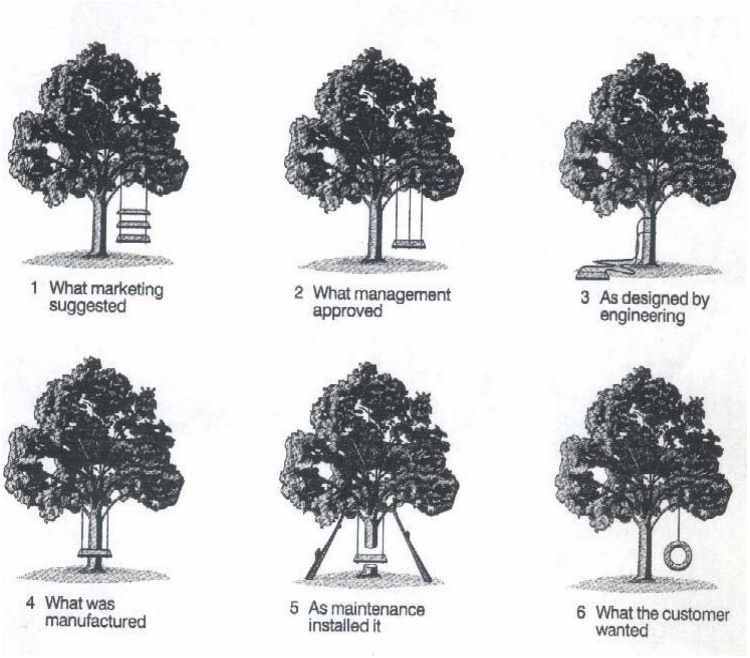

Figure 5. What Really Customer Need (Oakland, 2000, pg 9)

Quality function deployment translates the needs and wants of customers into design tools. QFD can be used to increase customer satisfaction,

decrease delivery date and costs and solving problems for mentioned points. Technicians define QFD as a tool which translates the voice of customer into an engineering tool. The main difference appears on the depth of analysis. While a QFD application takes into consideration and measures organization performance cursory (quality dimensions, design requirements….), some QFD implementations can be much more detailed and contains process design, production design etc.

Acquiring market needs by listening to the Voice of Customer (VOC), sorting the needs, and numerically prioritizing them are early tasks in QFD. Voice of Customer is decided by evaluating quality dimensions and comparing them with products' existing characteristics.

According to John S. Oakland, Quality Function Deployment is a system which revealed voice of the customer which tells the unspoken, which tells what the customer really wants.

The activities included in QFD are:

- Market research
- Basic research
- Innovation
- Concept design
- Prototype design
- Final product or service testing
- After-sales service and trouble-shooting. (Oakland, 2000, pg 39)

A formal method is needed for making sure that everyone working on a design objectives and is aware of the interrelationships of the various parts of the design. A structured process is needed that will translate the voice of the customer to technical requirements at every stage of design and manufacturer. The house of quality, converts customer requirements into product design characteristics (Russell and Taylor, 2002, pg 94)

To satisfy customers, first of all voice of customer should be analyzed. The process of capturing the voice of the customer is described in the papers on Product Definition and Steps for Performing QFD. It is important to remember that there is no one monolithic voice of the customer. Customer voices are diverse. In consumer markets, there are a variety of different needs. Even within one buying unit, there are multiple customer voices (e.g. children versus parents). This applies to industrial and government markets as well. There are even multiple customer voices within a single organization: the voice of the procuring organization, the voice of the user, and the voice of the supporting or maintenance organization. These diverse voices must be considered, reconciled and balanced to develop a truly successful product. One technique to accomplish this is to use multiple columns for different priority ratings associated with each customer voice in the product planning matrix (Crow, 2002, pg1)

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(www.qfdi.org/what_is_qfd/history _of_qfd.htm)

The QFD team must answer three questions.

- WHO are the customers?
- WHAT does the customer need?
- HOW will the needs be satisfied?

WHO maybe decided by asking “Who will benefit from the successful introduction of this product, service or process?” once the customers have been identified, WHAT can be ascertain through interview/questionnaire/focus group process, or from the knowledge and judgment of the QFD team members. HOW is more difficult to determine, and will consist of the attributes of the product, service or process under development. This will constitute many of the action steps in a ‘QFD strategic plan (Oakland, 2000, pg 40).

At each stage of deployment, relationships between” what” is required and “how” it will be accomplished are determined mutually by process stakeholders. The matrix displays key customer requirements; whats and their relationship to technical design requirements; hows (Adiano and Roth, 1994, pg 27)

While the QFD matrices are a good communication tool at each step in the process, the matrices are the means and not the end. The real value is in the process of communicating and decision-making with QFD. QFD is oriented toward involving a team of people representing the various functional departments that have involvement in product development: Marketing, Design Engineering, Quality Assurance, Manufacturing/ Manufacturing Engineering, Test Engineering, Finance, Product Support, etc. (Crow, 2002, pg 1)

Once customer needs are gathered, they then have to be organized. The mass of interview notes, requirements documents, market research, and customer data needs to be distilled into a handful of statements that express key customer needs. Affinity diagramming is a useful tool to assist with this effort. Brief statements which capture key customer requirements are transcribed onto cards. A data dictionary which describes these statements of need is prepared to avoid any misinterpretation. These cards are organized into logical groupings or related needs. This will make it easier to identify any redundancy and serves as a basis for organizing the customer needs for the first QFD matrix. (Crow, 2002, pg 2)

3.2.5 QFD Methodology Flow: House of Quality

What the quality indicator is in the eye of the customer is extremely important. Nine quality dimensions for products have been motioned above. Perceived quality is affected largely by how much importance the target customer attributes to features or durability.

I think the best example can be given from car industry. However driving a car 900.000 km without a breakdown is everything for a customer, for another customer the flooring should be leather to call the car quality.

Conformance to design is truly crucial. If a want of customer is impossible in terms of abilities, capacity or strategies of the company, satisfying the mentioned wants of the customer is useless and illogical. In this case that customer or group of customers will not be target customers. This decision should be taken before designing a product. After giving the decision of abilities of the company and target customer, the company should give the design decision by the help of QFD.

There are many features and characteristics in the product design. There are many needs and wants which are demanded by the customer as well. Which feature of the product or service can meet the customer's need or want? It is necessary to find this feature and change it. House of quality finds the answer to this question by the help of the quality matrix which displays the relationship between customer needs or wants and the product or services' characteristics.

QFD has devised numerous tools to bring this fuzzy front end into clearer focus. Gleen Mazur suggested 9 steps as follows to solve this problem (Mazur, 2003, pg 2);

1. Define and prioritize business or organizational goals.

2. Define and prioritize customer segments based on critical business goal.
3. Visit customers in their place, Map their process. Gather verbatim.
4. Sort verbatim into appropriate dimensions of design and development. Translate verbatim into customer needs-positive statements of customer benefit that are free of any implementation or solution.
5. Get customer to structure the needs from his point of view which can be different from the organizations.
6. Look for missing, unvoiced or latent needs.
7. Have customer determine which needs are the most important and how they measure their degree of satisfaction.
8. Translate top1-3 needs in to functional requirements and develop solutions, end-to-end.
9. If necessary, benchmarking preferred alternatives.

3.2.6 Establishing the House of Quality

The House of Quality is the principal tool for QFD (Shin, Kim and Chandra, 2002, pg 472). Mill identified the house of quality matrix as a summary of a large amount of information (Mill, 1994, pg 25). QFD is carried out by a cross-functional team of individuals who have been charged with responsibility for developing a new product, service or process or for improving an existing one. Following the steps above, it is indicated which customers are target customers. We can examine house of quality as parts. These are roof, customer requirements, weight of customer requirements, competitive analysis, design characteristics, relationship matrix, technical analysis and targets, and design changes.

Customer requirements (Area 2): The team goes through a process of filling in a large matrix; The House of Quality (In view of its shape) which includes a set of customer needs (The Voice of the Customer). According to Mill, once all customer requirements are identified, statements of their individual needs are required to start QFD (Mill, 1994, pg 23). These customer requirements are listed on the customer requirement area. Customer needs and wants should be determined by giving the customers surveys in sufficient numbers or customer interview. Selection of these customer requirements is very important. A company cannot satisfy all customer requirements. So the team should select most important customer requirements to make relevant changes. This selection enables cost saving, time saving and focusing on most important customer requirements

Weight of customer requirements (Area 3): Some requirements are more important than others. That is why to indicate which requirements are more important; we use importance part, which is **"**weight of customer requirements". So we can focus on these certain most important requirements. If the number of needs or requirements exceeds twenty to thirty items, Kenneth Crow suggested decomposing the matrix into smaller modules or subsystems to reduce the number of requirements in a matrix (Crow, 2000, http://www.npd-solutions.com)

Design characteristics (Area 5): Design characteristic area shows technical features of focused thing. These columns have been called many things; engineering characteristics, technical quality characteristics, quality specifications, functional requirements, or any process. These design characteristics, become the design specifications for the new product or service. An important benefit of the QFD process is that it forces the team to think creatively about how to solve various system design problems and which metrics to put in place to be sure that they are evaluating their progress correctly. In order to change product design to better satisfy customer requirements, we need to translate those requirements to measurable design characteristics. We list these characteristics on area 5. Technical people from manufacturing or RE&DE departments of QFD team contribute to identify design characteristics and relation ships between design characteristics and customer requirements.

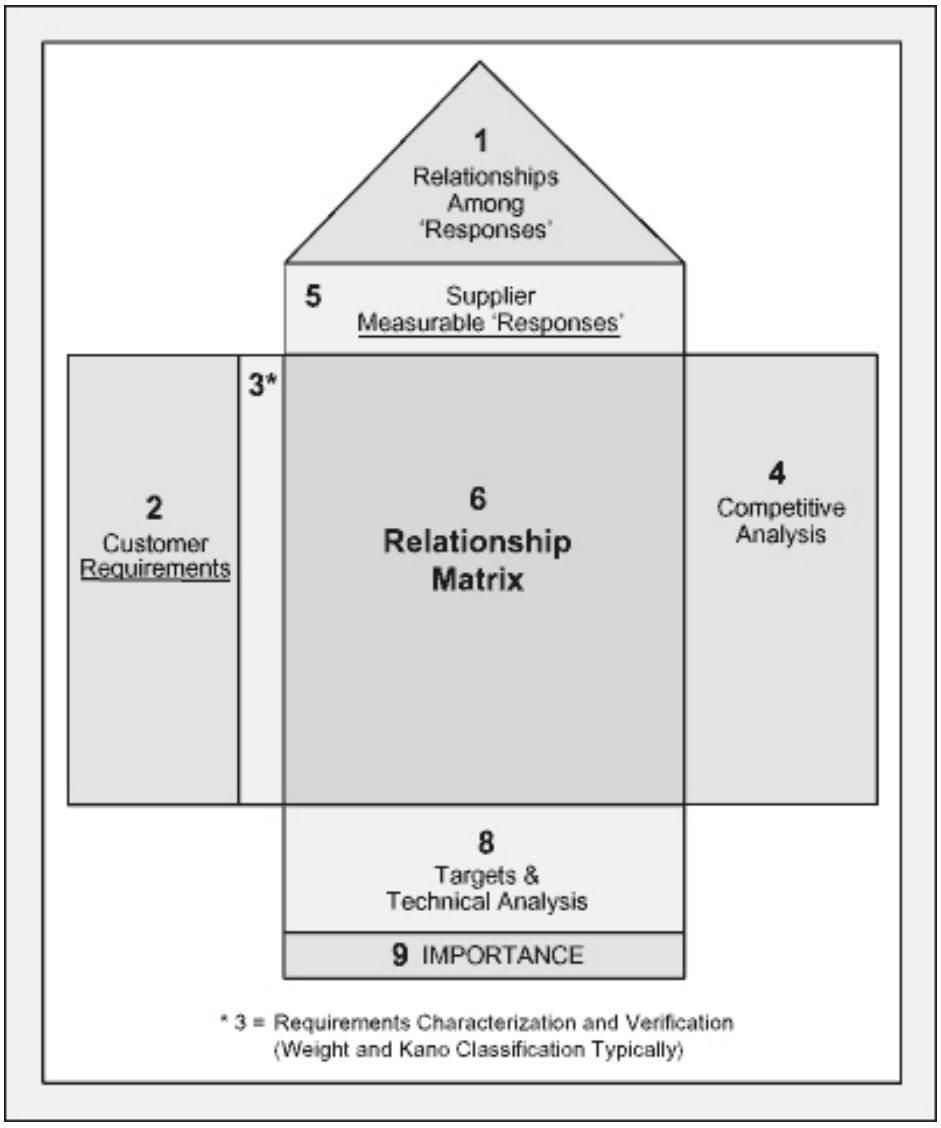

Figure 6. House of Quality (Crow, 2000 http://www.npd-solutions.com)

Relation ship matrix (Area 6): Relationship between customers wants and technical characteristics are given on the relationship matrix (Area 6). We here define how the design characteristics relate to customer requirements. Relationship should be between strong positive relation ship and strong negative relationship. Sometimes there can be no relationship between customer needs and design characteristics. That area shows which characteristics should be changed in order to satisfy customer requirements. What the relationship here refers to is that, one of the design

characteristics in area 5 is involved in getting the customer wants. For instance the scent put into the formula is in direct relationship with the beautiful smell of the cosmetic, even more, the relationship is strong positive. But there is no relationship between the beautiful scent of the cosmetic and the box design of the cosmetic.

Roof (Area 1): Product design characteristics are interrelated also as, shown in the roof of the house of quality. This area called Trade-off matrix (Russell and Taylor, 2002, pg96). For instance, with the derma-cosmetics, the customers may want the product to be both natural and fragrant. To make the product fragrant, scent should be put in the product and this process ruins the naturalness of the product. The area in which the technical feature of good smell and the technical feature of naturalness intersect is marked in the house of quality. After this step we can decide which design characteristic to be changed. This matrix shows interrelation between design characteristics. These interrelations should be examined carefully. If there is negative interrelation between design characteristics, this can be caused some difficulties. This means if mentioned design characteristic is redesigned, relevant customer requirement cannot be satisfied because of the interrelation other design characteristic has negative interrelation.

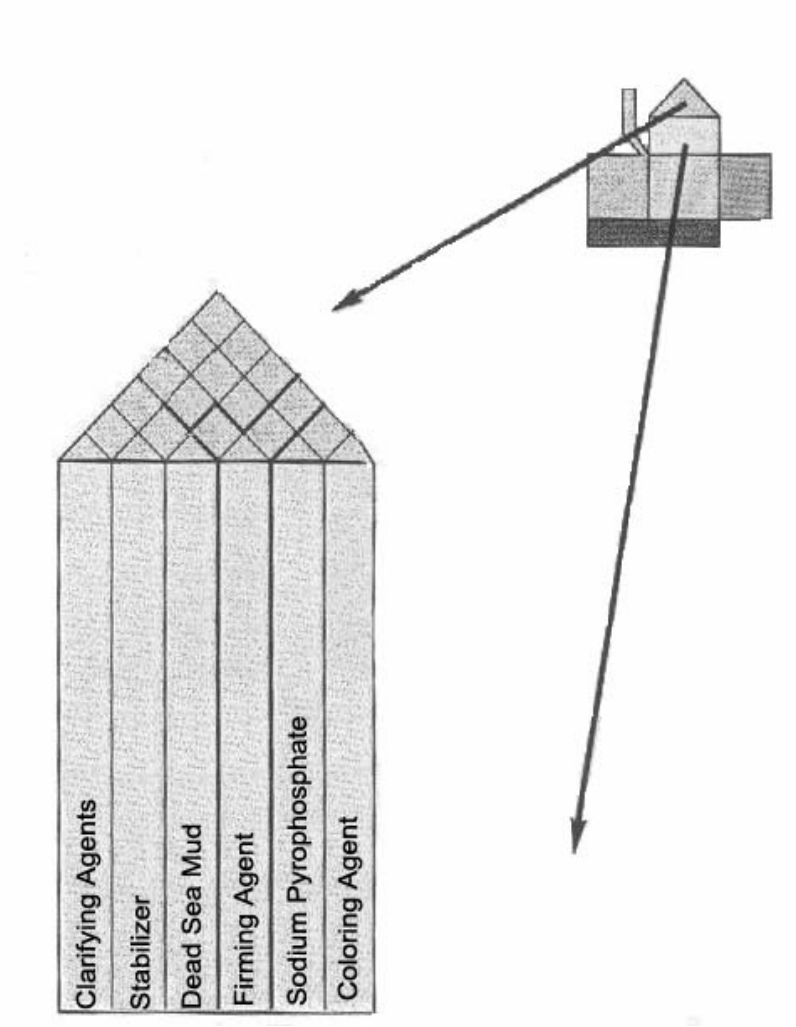

Figure 7. Roof of House of Quality for Sea Weed Mask

Competitive assessment (Area 4): Competitive assessment section can be called benchmarking section (area 4). In this section competitors and the relevant product are placed and customers rank these products according to satisfaction ability for customer needs and wants, according to area 2. This part clarifies products or company's positioning or the place in the customer's eyes. Evaluate prior generation products against competitive products. Use surveys, customer meetings or focus groups/clinics to obtain feedback. Include competitor's customers to get a balanced perspective. Identify price points and market segments for products under evaluation.

Competitive analysis part (area 4) enables us to compare competitors. Benchmarking enables to compare the company with its rivals. In this area consumers compare products of companies in terms of customer requirements. This shows companies' condition in the market in relation with their competitors. Ginn and Zairi explained the purpose of the benchmarking survey on QFD usage patterns was to check the importance of having consistently well trained and well maintained cross-functional teams with multi-disciplinary skills, all of which are factors highlighted in previous studies (Ginn and Zairi, 2005, pg 42).

Technical analysis and targets and design changes (Area 8 and Area 9): Technical analysis and targets, and design changes are examined together. When deciding which characteristics will be designed, the company should set its target values. Area 8 shows these target values, competitors' values and existing values. So the designer can easily see where the product is in relation with target values. Estimated cost and estimated impact analyses are evaluated again in this area. The company may not have the enough manpower or financial convenience to make all the necessary changes. Therefore the company needs to take a decision. Which characteristics are important and prior to change? Estimated impact analyses are made in the estimated area 8 and the characteristics that reach to a certain rating are changed. That kind of a choice is of lower cost to the company. Design is a mater that requires a longer time and more money. Not every company can afford such a work. A decision should be taken by considering the design team, priority rate, estimated cost and

estimated impact. So, area 6 and area 8 are analyzed together and it is decided which characteristic will be changed.

Help is demanded from the marketing department to evaluate estimated impact. The department which knows the customer best is the marketing department. They get the feedback first. For this reason marketing department predicts how much the sales are going to raise if a characteristic is changed. Estimated impact is important because how much the sales are going to raise after the change is an important issue. If there is no raise worth the change, then all the efforts are wasted.

Often cost is a critical factor in determining whether the system will be carried out or not. For assessing the feasibility of a system being developed in future, estimating the cost of system in the conceptual phase becomes more and more important. The cost structure of systems is first determined according to four cost items: the direct material cost, the direct labor cost, the variable factory cost and the fixed factory cost. Nowadays low cost production is an extremely crucial competitive advantage. In QFD study we may mention two different estimated costs. According to Kenneth Crow Value is not a matter of minimizing cost. In some cases the value of a product can be increased by increasing its function (performance or capability) and cost as long as the added function increases more than its added cost. The concept of functional worth can be important. Functional worth is the lowest cost to provide a given function. However, there are less tangible "selling" functions involved in a product to make it of value to a customer (Crow, 2002, pg 1). Kenneth Crow formulated the value as below;

Value = (Performance + Capability)/Cost = Function/Cost

Deciding the technical characteristics to be developed and measuring quality costs are most difficult steps for design team. As mentioned above, the company needs to decide which design characteristic to change. This would be a strategically decision for the company. Changing which product's which technical characteristics to fulfill which of the customer needs and wants that are determined in the area 2 is determined in the area 8 after making an expense analyses. Then target values are set. However there is a hitch at this point. In target value part, generally rival product's technical characteristics' values are compared. The biggest handicap is that it is not always possible to reach that rival product's values. While these technical values are easily determined and compared in motor industry or electronic products, it is not easy to make comparison in a sector in which there are formulas, like cosmetic sector. You cannot always reach the formula of the rival product. While analyzing olive oil with the help of a chromatography device is easy, analyzing of a cosmetic product may be a lot longer and expensive. For this very reason, companies may have to have customer surveys to make comparisons for some products. At this point, comparison criteria may be subjective criteria like customer satisfaction.

The basic Quality Function Deployment methodology involves four basic phases that occur over the course of the product development process. During each phase one or more matrices are prepared to help plan and

communicate critical product and process planning and design information. This QFD methodology flow is represented below (Crow, 2002, http://www.npd-solutions.com). In this study only product design is focused on.

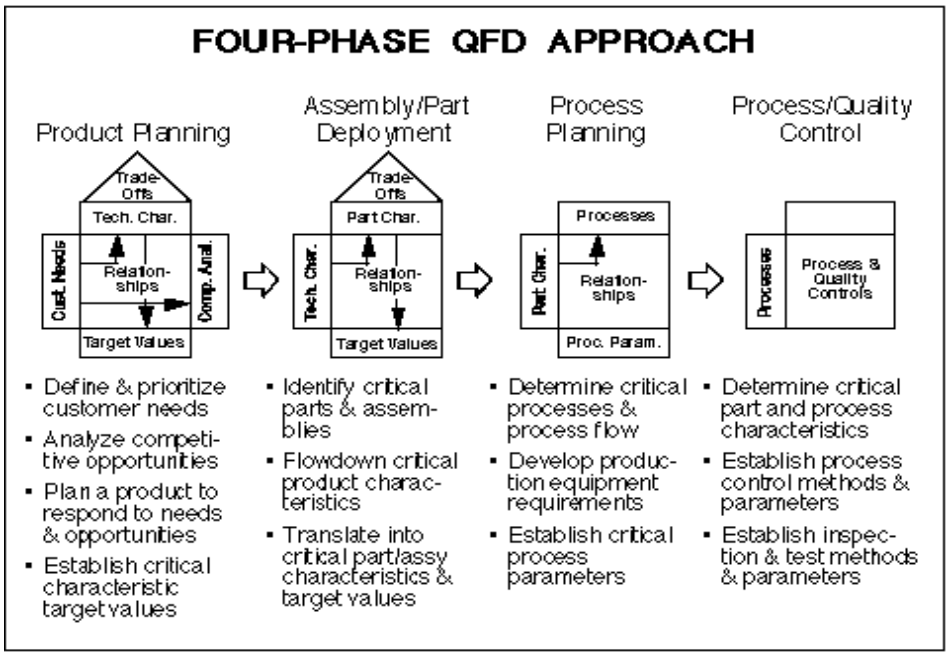

Figure 8. Four-phase of QFD approach (Crow, 2002, http://www.npd-solutions.com)

Rahim and Baksh explain these four bases briefly. The result of each phase is used in the next phase throughout the QFD process. This way, the voice of customer is carried forward until the manufacturing and control phase. In the first matrix, which is the product planning phase, customer requirements are in the input. These requirements are then compared with engineering characteristics to establish the relationship between them. In part deployment or product design phase, engineering requirements are examined along with parts characteristics. The third matrix translates the output of the parts deployment matrix into key process operations. Finally,

in phase IV, key process operations are compared against production requirements (Rahim and Baksh,2003, pg 376).

3.4 BENEFITS OF QUALITY FUNCTION DEPLOYMENT

- QFD brings the voice of customer into the company supremely. In this way customer needs and wants are prioritized in design process. So expose of goods are successful because marketed products or services meet customer needs and wants. Customers gain products and services as they want quickly. (www.12manage.com/methods_akao_quality_function_ deployment.html)
- QFD enables the design group to see events and conditions in different point o views. The problem is solved by evaluating relationships between problems and using statistical methods. Therefore, company can produce more reliable and quality products and services.
- QFD enables low costs and maximum performance in production process.
- The extended part of adjustments and changes are made in the design step. All design decisions are taken at the beginning. Thus company save making a mistake chance in the design process and the expenses that are caused by mistakes.
- In product and process design steps, company can save costs because extended part of resources is used at the beginning, in order to realize products and services which meet customer requirements and wants.
- Reduce time to market
- Reduction in design change

- QFD Improves quality
- QFD decreases design and manufacturing cost
- QFD increases customer satisfaction
- QFD makes invisible requirements and strategic advantages visible. This allows a company to prioritize and deliver on them. (http://www.12manage.com/methods_akao_quality_function_deployment.html)

When we examine House of Quality and other elements of QFD, it is obvious that QFD is a scientific system which reveals required modifications according to customer requirements. This system consists of design characteristics, customer requirements, benchmarking, cost and sales estimation, product or service design, interaction between design characteristics and relation ship between design characteristics and customer requirement. To summarize, QFD is a decision system which decides modifications and target values for a product or design.

4. QFD IMPLEMENTATION

4.1 METODOLOGY OF THE STUDY

Dead Sea Spa Magik (DSM) products are produced in England by Finders International. Sahkale Özel Sağlık Hizmetleri Ltd. is exclusive importer for Aegean, Mediterranean and Marmara Regions. Previous exclusive distributor was failed. So Sahkale should reenter the market. Still sales are not promising. DSM is being tried positioning again.

Steps of the study:

1. To increase sales I decided to suggest the producer making some modifications on 3 products. To this end I decided to use QFD method to determine required modifications on 3 products. These three products are Skin Softener, Algimud Active Seaweed Mask and Black Mud Soap.
2. The study was conducted in Izmir City. Izmir office is headquarter office and sales are constituted of remarkable part of all Turkey sales. That is why Izmir was chosen as the research area.
3. In downtown, there are 41 pharmacies which are retailers of DSM. Eleven pharmacies constituted 65% of Izmir's sales in 2006. These 11 pharmacies are shown on Table 1. These numbers was taken from Account department of Sahkale on 1st of November 2006.

NAME OF PHARMACY	SALES (YTL)
LOZAN	2.224,62
SARMAŞIK	3.526,52
ANDAÇ	3.978,13
BURCU	4.093,89
KARŞIYAKA MERKEZ	4.472,55
YAKAMOZ	4.626,05
GAMZE	5.133,18
ERCAN	5.841,59
BÜYÜK İZMİR	5.966,08
GALEN	6.890,19
KARŞIYAKA ÇAĞDAŞ	9.791,52

Table 1. List of 11 pharmacies which is constituting of Izmir 67% sales.

4. Marketing department estimates there are about 300 DSM users in downtown Izmir. To reflect the population 50 random sample were selected from these 11 pharmacies. These 50 samples are about 16.67% of these 300 users. At the beginning of the study 100 samples were aimed but because of some difficulties only 50 inquiries were filled out. The main difficulty is low sales. DSM has far too few users. So in retailers' stores we cannot find DSM user easily.
5. SPSS was used to compute statistics data. Regression method was used to analyze relationships.
6. By the help of SPSS customer requirements were found in order to use in House of Quality.
7. By the help of SPSS four brands were chosen in order to use in competitive assessment part of House of quality.
8. Formulations for relevant products were obtained from Finders International. These are design characteristics. So these

formulations constituted design characteristic part of House of Quality.

9. Estimated cost and estimated impact data were obtained from Finders International. The company only gave percentage of estimated cost and estimated impact because Finders International refused to release its company secret. Also these data were used to compute technical analysis part of House of Quality
10. Design characteristics of rivals were obtained from Finders International's marketing department. Also these data were used to compute technical analysis part of House of Quality
11. Target values were obtained from Finders International's Research and Development department. These data were used in target valued part of House of Quality.
12. To decide which design characteristics will be changed, QFD method, House of Quality was used was used.

4.2 RESULTS OF THE INQUIRY SURVEY

There are too many brands in the market. Moreover cosmetics market is not developed. That is why derma-cosmetics and cosmetics cannot be distinguished enough. According to inquiry results, make-up products are the most used products (Table 2). Moisturizing creams and face and body cleansing products are consequently the most used products. (Table3 and 4)

	Frequency	Percent	Valid Percent	Cumulative Percent
Make-up	17	34,0	34,0	34,0
Hand cream	9	18,0	18,0	52,0
Moisturizer and face cream	10	20,0	20,0	72,0
Body products (creams and milks)	1	2,0	2,0	74,0
Face and body cleansing tonics	7	14,0	14,0	88,0
Peeling products	1	2,0	2,0	90,0
Cellulite cream	3	6,0	6,0	96,0
Spot products	1	2,0	2,0	98,0
Anti-aging products	1	2,0	2,0	100,0
Total	50	100,0	100,0	

Table 2. The most used products

	Frequency	Percent	Valid Percent	Cumulative Percent
Make-up	8	16,0	18,2	18,2
Hand cream	6	12,0	13,6	31,8
Moisturizing and face cream	14	28,0	31,8	63,6
Body products(creams and milks)	2	4,0	4,5	68,2
masks	2	4,0	4,5	72,7
Face and body cleansing tonics	9	18,0	20,5	93,2
Peeling products	2	4,0	4,5	97,7
Anti-aging products	1	2,0	2,3	100,0
Total	44	88,0	100,0	
Missing	6	12,0		
Total	50	100,0		

Table 3. The second most used products

	Frequency	Percent	Valid Percent	Cumulative Percent
Make-up	2	4,0	7,4	7,4
Hand cream	4	8,0	14,8	22,2
Moisturizing and face cream	7	14,0	25,9	48,1
Body products(creams and milks)	2	4,0	7,4	55,6
Face and body cleansing tonics	5	10,0	18,5	74,1
Peeling products	2	4,0	7,4	81,5
Sun safe	1	2,0	3,7	85,2
Perfume	2	4,0	7,4	92,6
Anti-aging products	2	4,0	7,4	100,0
Total	27	54,0	100,0	
Missing	23	46,0		
Total	50	100,0		

Table 4. The third most used products

This shows us the market has not matured. Also expenditures of consumers are too low when compare to developed countries as previously mentioned before, cosmetic expenditure is under 100 YTL (Table 5)

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than100 YTL	34	68,0	68,0	68,0
Between 100 YTL and 200YTL"	11	22,0	22,0	90,0
Between 201 YTL and 300YTL"	3	6,0	6,0	96,0
Between 301 YTL and 400 YTL"	1	2,0	2,0	98,0
More than 401	1	2,0	2,0	100,0
Total	50	100,0	100,0	

Table 5. Monthly cosmetic consumptions

However, the market has not matured; there are too many competitors in the cosmetic market. This increases the competition between companies and decreases market shares. The market share of DSM is estimated as

7% of Izmir's cosmetic market by. However we targeted only DSM users 11.7 % of people who filled inquiries use DSM products (Table 6)

	Frequency	Percent	Valid Percent	Cumulative Percent
DSM	15	11,7	11,7	11,7
Avon	26	20,3	20,3	32,0
Vichy	11	8,6	8,6	40,6
L'Oreal	15	11,7	11,7	52,3
Lancôme	2	1,6	1,6	53,9
Roc	2	1,6	1,6	55,5
Laroche Posey	4	3,1	3,1	58,6
Clinique	2	1,6	1,6	60,2
Seba-Med	5	3,9	3,9	64,1
Nivea	12	9,4	9,4	73,4
Arko	2	1,6	1,6	75,0
Other	11	8,6	8,6	83,6
No comment	1	,8	,8	84,4
Estalauder	3	2,3	2,3	86,7
Neutrogena	3	2,3	2,3	89,1
Other Make-up	6	4,7	4,7	93,8
Biotherm	1	,8	,8	94,5
Novatox	1	,8	,8	95,3
Avene	1	,8	,8	96,1
Virage	1	,8	,8	96,9
Ohtpeptide	1	,8	,8	97,7
MD Formulations	2	1,6	1,6	99,2
ID minerals	1	,8	,8	100,0
Total	128	100,0	100,0	

Table 6. The most used Brands.

Other brands are DDF, Christian Dior, Valmont, Cecedille, and Channel.

The number one brand is AVON in Izmir cosmetics market. The second brands are DSM and L'Oreal. Although DSM's shares seem high; this result does not reflect the market share. These inquiries were filled in DSM retailers. That is why most of the inquiries were filled by DSM users.

There is no relationship between the welfare of people and cosmetic expenditures. The regression model was compute by the help of SPSS.

Since the significance value 0,199 is bigger than 0.05 we can say 95% confidently; the consumers' cosmetic spending is independent from their incomes. Table 7 shows us F and Significant value of the Regression Model.

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	**Sig.**
1	**Regression**	**1,244**	**1**	**1,244**	**1,694**	**,199(a)**
	Residual	35,236	48	,734		
	Total	36,480	49			

Table 7. ANOVA table of regression model

This shows us that consumers in the Izmir market do not spend more for their personal care. Companies in the market place should find ways of increasing sales. As I mentioned before, Turkey's cosmetic market is not developed enough when we compare its market with the Global market. So this causes a big competition among too many competitors. Since the market is not big enough, derma-cosmetic and cosmetic brands are compete in the same area. To increase DSM's sales, Sahkale QFD study was decided to perform and modify three products. These products are Skin Softener, Algimud Active Seaweed Mask and Black Mud Soap.

Skin softener is perfect for dry skin. It nourishes and freshens the skin. The product enables the skin to stay humid. It is used to cure psoriasis, neurodermit, sebore, eczema, and extremely dry skin due to menopause. *Algimud Active Seaweed Mask* balances the ph of the skin. It makes the skin remarkably beautiful. It freshen the skin and provides a shine and fresh view. It also removes dirt from the skin. The product is used to cure spots, sebore and rosacae. *Black Mud Soap* is anti-bacterial and cleans pores. It

contains a high level of Dead Sea minerals. It balances the skin's humidity and oil. It is a cleanser for spotty and greasy skin. It is used to cure psoriasis, skin infections, sebore dermatitis, and eczema.

These three products' technical characteristics are called "design characteristics". These design characteristics are written below.

SKIN SOFTENER

TECHNICAL FEATURES	
Dead sea minerals (skin conditioners)	natural
Emollient (softener)	artificial
Film forming oil	artificial
Carrier (purified water)	nature
Emulsifier	artificial

Table 8. Design characteristics of Skin Softener

ALGIMUD ACTIVE SEAWEED MASK

TECHNICAL FEATURES	
Clarifying agents	natural
Stabilizer	artificial
Dead Sea Mud	natural
Firming Agent	artificial
Sodium Pyrophosphate	artificial
Coloring Agent	artificial

Table 9. Design characteristics of Algimud Active Seaweed Mask

BLACK MUD SOAP

TECHNICAL FEATURES	
Emulsifier	artificial
Opacifier, Surfactant	artificial
Carrier (aqua)	natural
Dead Sea Mud	natural
Humectants (Glycerin)	natural
Antiseptic, Astringent	artificial
Sequestering, chelating agent EDTA	artificial
Sequestering, chelating agent Etidronate	artificial

Table10. Design characteristics of Black Mud Soap

When we analyzed inquiries, we found there are 7 most important customers' requirements. We asked 15 features. These are;

1- Therapeutic effect should be revealed quickly.
2- Product should have a nice fragrance.
3- Product should include traditional substance.
4- Product's color and smell should not change after opening the package.
5- Product should be hypo-allergic.
6- Product should cure without including chemicals.
7- Product can be used in different ways.
8- Product should have a package design which does not cause wrong use or quick finish.
9- Product should soothe the problem (before curing it) during the first use.
10- Product can be used for a long period of time.
11- The package should not spoil too soon.
12- Frequent use should not be necessary to reveal therapeutic effect.
13- The product should have an instantaneous effect.
14- The package design should be slightly.
15- The package and the product should be easy to use.

Numbers show features code numbers. 50 samples chose their most important 7 features. These are shown on the Table 11. From Table 12 to Table 18 show how these seven customer requirements were chosen among fifteen customer requirements. Samples put 1 for the most important customer requirement. Also they put 15 the less important requirement. So samples ranked customer requirements. Most important seven customer

requirements were evaluated. For each rank the most preferred customer requirement was compute by the help of SPSS.

		Q8a	Q8b	Q8c	Q8d	Q8e	Q8f	Q8g
N	Valid	50	50	50	50	50	50	50
	Missing	0	0	0	0	0	0	0
Mode		1	5	9	6	4	3	13

Table 11 Most important 7 features.

Q8a: The most important customer requirement

Q8b: The second most important customer requirement

Q8c: The third most important customer requirement

Q8d: The fourth most important customer requirement

Q8e: The fifth most important customer requirement

Q8f: The sixth most important customer requirement

Q8g: The seventh most important customer requirement

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly	19	38,0	38,0	38,0
Product's color and smell should not change after opening the package.	2	4,0	4,0	42,0
Product should be a hypo-allergic	14	28,0	28,0	70,0
Product should cure without including chemicals	10	20,0	20,0	90,0
Product should soothe the problem (before curing) at the first use.	1	2,0	2,0	92,0
The package should not be spoiling for a long period	1	2,0	2,0	94,0
Frequency use should not be necessary to reveal therapeutic effect	3	6,0	6,0	100,0
Total	50	100,0	100,0	

Table 12. The most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly.	11	22,0	22,0	22,0
Product should have a nice fragrance	1	2,0	2,0	24,0
Product should be a hypo-allergic	18	36,0	36,0	60,0
Product should cure without including chemicals	7	14,0	14,0	74,0
Product should soothe the problem (before curing) at the first use	7	14,0	14,0	88,0
Product can be used for a long period	2	4,0	4,0	92,0
Frequency use should not be necessary to reveal therapeutic effect	2	4,0	4,0	96,0
A product should have an instantaneous effect	2	4,0	4,0	100,0
Total	50	100,0	100,0	

Table 13. The second most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly.	5	10,0	10,0	10,0
Product should have a nice fragrance	2	4,0	4,0	14,0
Product should include traditional substance	3	6,0	6,0	20,0
Product's color and smell should not change after opening the package	2	4,0	4,0	24,0
Product should be a hypo-allergic	5	10,0	10,0	34,0
Product should cure without including chemicals	9	18,0	18,0	52,0
Product can be used different ways	3	6,0	6,0	58,0
Product should have a package design which does not cause wrong us or quick finish	1	2,0	2,0	60,0
Product should soothe the problem (before curing) at the first use	14	28,0	28,0	88,0
Product can be used for a long period	1	2,0	2,0	90,0
Frequency use should not be necessary to reveal therapeutic effect	1	2,0	2,0	92,0
A product should have an instantaneous effect.	3	6,0	6,0	98,0
The package design should be slightly	1	2,0	2,0	100,0
Total	50	100,0	100,0	

Table14. The third most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly	5	10,0	10,0	10,0
Product should have a nice fragrance	1	2,0	2,0	12,0
Product's color and smell should not change after opening the package	2	4,0	4,0	16,0
Product should be a hypo-allergic	8	16,0	16,0	32,0
Product should cure without including chemicals	9	18,0	18,0	50,0
Product can be used in different ways	2	4,0	4,0	54,0
Product should have a package design which does not cause wrong us or quick finish.	4	8,0	8,0	62,0
Product should soothe the problem (before curing) at the first use	3	6,0	6,0	68,0
Product can be used for a long	6	12,0	12,0	80,0
The package should not be spoiling for a long period	1	2,0	2,0	82,0
Frequency use should not be necessary to reveal therapeutic effect	5	10,0	10,0	92,0
A product should have an instantaneous effect	4	8,0	8,0	100,0
Total	50	100,0	100,0	

Table15. The fourth most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly	1	2,0	2,0	2,0
Product should have a nice fragrance	7	14,0	14,0	16,0
Product should include traditional substance	2	4,0	4,0	20,0
Product's color and smell should not change after opening the package	8	16,0	16,0	36,0
Product should be a hypo-allergic	4	8,0	8,0	44,0
Product should cure without including chemicals	2	4,0	4,0	48,0
Product can be used in different ways	2	4,0	4,0	52,0
Product should soothe the problem (before curing) at the first use.	6	12,0	12,0	64,0
Product can be used for a long period.	5	10,0	10,0	74,0
The package should not be spoiling for a long period	3	6,0	6,0	80,0
Frequency use should not be necessary to reveal therapeutic effect	4	8,0	8,0	88,0
A product should have an instantaneous effect	3	6,0	6,0	94,0
The package design should be slightly.	3	6,0	6,0	100,0
Total	50	100,0	100,0	

Table 16. The fifth most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly	4	8,0	8,0	8,0
Product should have a nice fragrance	8	16,0	16,0	24,0
Product should include traditional substance	9	18,0	18,0	42,0
Product's color and smell should not change after opening the package	4	8,0	8,0	50,0
Product should be a hypo-allergic	1	2,0	2,0	52,0
Product can be used in different ways	2	4,0	4,0	56,0
Product should have a package design which does not cause wrong us or quick finish	2	4,0	4,0	60,0
Product should soothe the problem (before curing) at the first use	4	8,0	8,0	68,0
Product can be used for a long period	4	8,0	8,0	76,0
The package should not be spoiling for a long period.	1	2,0	2,0	78,0
Frequency use should not be necessary to reveal therapeutic effect	4	8,0	8,0	86,0
A product should have an instantaneous effect	4	8,0	8,0	94,0
The package design should be slightly	3	6,0	6,0	100,0
Total	50	100,0	100,0	

Table 17. The sixth most important feature

	Frequency	Percent	Valid Percent	Cumulative Percent
Therapeutic effect should be revealed quickly	1	2,0	2,0	2,0
Product should have a nice fragrance	6	12,0	12,0	14,0
Product should include traditional substance	3	6,0	6,0	20,0
Product's color and smell should not change after opening the package	4	8,0	8,0	28,0
Product should cure without including chemicals	1	2,0	2,0	30,0
Product can be used in different ways	4	8,0	8,0	38,0
Product should have a package design which does not cause wrong us or quick finish	3	6,0	6,0	44,0
Product should soothe the problem (before curing) at the first use	3	6,0	6,0	50,0
Product can be used for a long period	6	12,0	12,0	62,0
The package should not be spoiling for a long period	2	4,0	4,0	66,0
Frequency use should not be necessary to reveal therapeutic effect	3	6,0	6,0	72,0
A product should have an instantaneous effect	8	16,0	16,0	88,0
The package design should be slightly	4	8,0	8,0	96,0
The package and the product should have an easy use	1	2,0	2,0	98,0
other	1	2,0	2,0	100,0
Total	50	100,0	100,0	

Table 18. The seventh most important feature

To summarize, the seven most important customer requirements are as fallows;

1 Therapeutic effect should be revealed quickly.

2 Product should be a hypo-allergic

3 Product should soothe the problem (before curing) at the first use

4 Product should cure without including chemicals

5 Product's color and smell should not change after opening the package

6 Product should include traditional substance

7 A product should have an instantaneous effect

These requirements are put into a second area of House of Quality

CUSTOMER REQUIREMENT	***IMPORTANCE***
Therapeutic effect should be revealed quickly.	7
Product should be a hypo-allergic	6
Product should soothe the problem (before curing) at the first use	5
Product should cure without including chemicals	4
Product's color and smell should not change after opening the package	3
Product should include traditional substance	2
A product should have an instantaneous effect	1

Table 19. Customer requirements

Most important customer requirement's importance is 7 and less important customer requirement's importance is 1 these customer requirement were used in customer requirement part of House of Quality

In the cosmetic sector products are constituted of formulations. Interrelations between ingredients are not acceptable for cosmetics or medicinal products. That is why the trade-off matrix does not include any relationship.

In question 9 of the inquiry, customers were requested to compare four brands in terms of customer requirement. Since there are too many brands on the market, question 9 is an open-end question. By the help of SPSS, I

selected the four most preferred brands. These are AVON, VICHY, DSM and SEBA-MED. Since market is not matured and separated according to products' characteristics, customers perceive derma-cosmetic and cosmetic products are the same. That is why Vichy and Avon are most important competitors of DSM even they are not derma-cosmetic brands. Since seven customer requirements were chosen, in comparison part these seven customer requirements are taking into consideration. First the most preferred four brands were found by the help of SPSS. From Table 21 to Table 23 show these four brands. From Table 24 to Table 51 show the comparison of these four brands in terms of most important seven customer requirements which are found above. Comparison results are shown below;

Rank 4: the best brand relative to the other three brands

Rank 3: the second brand relative to the other three brands

Rank 2: the third brand relative to the other three brands

Rank 1: the worse brand relative to the other three brands

	Frequency	Percent	Valid Percent	Cumulative Percent
DSM	6	12,0	14,6	14,6
Avon	9	18,0	22,0	36,6
Vichy	9	18,0	22,0	58,5
L'Oreal	3	6,0	7,3	65,9
Lancôme	2	4,0	4,9	70,7
Laroche Posey	2	4,0	4,9	75,6
Clinique	4	8,0	9,8	85,4
Seba-Med	1	2,0	2,4	87,8
Nivea	4	8,0	9,8	97,6
Cecedille	1	2,0	2,4	100,0
Total	41	82,0	100,0	
System	9	18,0		
Total	50	100,0		

Table 20 the most preferred brand as the best brand relative to the other three brands

Avon and VICHY are two brand selected as best two brands by customer filled inquiries.

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	2	4,0	5,4	5,4
	Avon	7	14,0	18,9	24,3
	Vichy	7	14,0	18,9	43,2
	L'Oreal	5	10,0	13,5	56,8
	Lancôme	1	2,0	2,7	59,5
	Roc	1	2,0	2,7	62,2
	Laroche Posey	4	8,0	10,8	73,0
	Seba-Med	1	2,0	2,7	75,7
	Nivea	4	8,0	10,8	86,5
	Nutrogeana	1	2,0	2,7	89,2
	Biotherm	2	4,0	5,4	94,6
	Cecedille	1	2,0	2,7	97,3
	MD Formulations	1	2,0	2,7	100,0
	Total	37	74,0	100,0	
	System	13	26,0		
Total		50	100,0		

Table 21. The most preferred brand as the second brand relative to the other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	4	8,0	16,7	16,7
	Avon	5	10,0	20,8	37,5
	Vichy	2	4,0	8,3	45,8
	L'Oreal	1	2,0	4,2	50,0
	Roc	2	4,0	8,3	58,3
	Laroche Posey	1	2,0	4,2	62,5
	Seba-Med	4	8,0	16,7	79,2
	Nivea	2	4,0	8,3	87,5
	Other	1	2,0	4,2	91,7
	Biotherm	2	4,0	8,3	100,0
	Total	24	48,0	100,0	
	System	26	52,0		
Total		50	100,0		

Table 22. The most preferred brand as the third brand relative to the other three brands

DSM and SEBA-MED are other two brands selected by customers who filled inquiries (Table22 and Table 23). AVON, VICHY, DSM and SEBA-MED were coded and compute their frequencies by the help of SPSS. After selecting four brands, their ranks were determined in terms of seven important customer requirements found before.

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	4	8,0	28,6	28,6
	Avon	2	4,0	14,3	42,9
	Vichy	2	4,0	14,3	57,1
	L'Oreal	1	2,0	7,1	64,3
	Roc	1	2,0	7,1	71,4
	Seba-Med	3	6,0	21,4	92,9
	Nivea	1	2,0	7,1	100,0
	Total	14	28,0	100,0	
	System	36	72,0		
Total		50	100,0		

Table 23. The most preferred brand as the worse brand relative to the other three brands

For the first customer requirement ranks are shown from table 24 to Table 27.

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	8	16,0	33,3	33,3
	Avon	3	6,0	12,5	45,8
	Vichy	8	16,0	33,3	79,2
	Seba-Med	5	10,0	20,8	100,0
	Total	24	48,0	100,0	
	System	26	52,0		
Total		50	100,0		

Table 24. The best brand for most important customer requirement relative to other three brands

Rank of DSM is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	4	8,0	22,2	22,2
	Avon	6	12,0	33,3	55,6
	Vichy	7	14,0	38,9	94,4
	Seba-Med	1	2,0	5,6	100,0
	Total	18	36,0	100,0	
	System	32	64,0		
Total		50	100,0		

Table 25. The third brand for most important customer requirement relative to the other three brands

Rank of VICHY is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	2	4,0	16,7	16,7
	Avon	7	14,0	58,3	75,0
	Vichy	1	2,0	8,3	83,3
	Seba-Med	2	4,0	16,7	100,0
	Total	12	24,0	100,0	
	System	38	76,0		
Total		50	100,0		

Table 26. The second brand for most important customer requirement relative to the other three brands

Rank of AVON is 2 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	3	6,0	25,0	25,0
	Avon	6	12,0	50,0	75,0
	Vichy	3	6,0	25,0	100,0
	Total	12	24,0	100,0	
	System	38	76,0		
Total		50	100,0		

Table 27. The worst brand for most important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

For the second customer requirement, ranks are shown from table 28 to Table 31.

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	12	24,0	42,9	42,9
	Avon	2	4,0	7,1	50,0
	Vichy	8	16,0	28,6	78,6
	Seba-Med	6	12,0	21,4	100,0
	Total	28	56,0	100,0	
	System	22	44,0		
Total		50	100,0		

Table 28. The best brand for second important customer requirement relative to the other three brands

Rank of DSM is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	Avon	8	16,0	80,0	80,0
	Vichy	2	4,0	20,0	100,0
	Total	10	20,0	100,0	
	System	40	80,0		
Total		50	100,0		

Table 29. The third brand for second important customer requirement relative to the other three brands

Rank of AVON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	2	4,0	15,4	15,4
	Avon	8	16,0	61,5	76,9
	Vichy	3	6,0	23,1	100,0
	Total	13	26,0	100,0	
	Syste m	37	74,0		
Total		50	100,0		

Table 30. The second brand for second important customer requirement relative to the other three brands

Rank of VICHY is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	1	2,0	8,3	8,3
	Avon	4	8,0	33,3	41,7
	Vichy	6	12,0	50,0	91,7
	Seba-Med	1	2,0	8,3	100,0
	Total	12	24,0	100,0	
	System	38	76,0		
Total		50	100,0		

Table 31. The worst brand for second important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

For the third customer requirement ranks are shown from table 32 to Table 35.

		Frequency	Percent	Valid Percent	Cumulative Percent
	DSM	4	8,0	19,0	19,0
	Avon	1	2,0	4,8	23,8
	Vichy	11	22,0	52,4	76,2
	Seba-Med	5	10,0	23,8	100,0
	Total	21	42,0	100,0	
	System	29	58,0		
Total		50	100,0		

Table 32. The best brand for third important customer requirement relative to the other three brands

Rank of VICHY is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	2	4,0	15,4	15,4
	Avon	6	12,0	46,2	61,5
	Vichy	4	8,0	30,8	92,3
	Seba-Med	1	2,0	7,7	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 33. The third brand for third important customer requirement relative to the other three brands

Rank of AVON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	4	8,0	40,0	40,0
	Avon	4	8,0	40,0	80,0
	Vichy	2	4,0	20,0	100,0
	Total	10	20,0	100,0	
Missing	System	40	80,0		
Total		50	100,0		

Table 34. The second brand for third important customer requirement relative to the other three brands

Rank of DSM is 2 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	2	4,0	15,4	15,4
	Avon	9	18,0	69,2	84,6
	Vichy	1	2,0	7,7	92,3
	Seba-Med	1	2,0	7,7	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 35. The worst brand for third important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

For the fourth customer requirement ranks are shown from table 36 to Table 39.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	15	30,0	53,6	53,6
	Vichy	6	12,0	21,4	75,0
	L'Oreal	1	2,0	3,6	78,6
	Seba-Med	6	12,0	21,4	100,0
	Total	28	56,0	100,0	
Missing	System	22	44,0		
Total		50	100,0		

Table 36. The best brand for fourth important customer requirement relative to the other three brands

Rank of DSM is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Avon	6	12,0	66,7	66,7
	Vichy	2	4,0	22,2	88,9
	Seba-Med	1	2,0	11,1	100,0
	Total	9	18,0	100,0	
Missing	System	41	82,0		
Total		50	100,0		

Table 37. The third brand for fourth important customer requirement relative to the other three brands

Rank of AVON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Avon	8	16,0	57,1	57,1
	Vichy	6	12,0	42,9	100,0
	Total	14	28,0	100,0	
Missing	System	36	72,0		
Total		50	100,0		

Table 38. The second brand for fourth important customer requirement relative to the other three brands

Rank of VICHY is 2 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	1	2,0	7,7	7,7
	Avon	5	10,0	38,5	46,2
	Vichy	6	12,0	46,2	92,3
	Seba-Med	1	2,0	7,7	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 39. The worst brand for fourth important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

For the fifth customer requirement ranks are shown from table 40 to Table 43.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	5	10,0	23,8	23,8
	Vichy	13	26,0	61,9	85,7
	Seba-Med	3	6,0	14,3	100,0
	Total	21	42,0	100,0	
Missing	System	29	58,0		
Total		50	100,0		

Table 40. The best brand for fifth important customer requirement relative to the other three brands

Rank of VICHY is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Avon	7	14,0	58,3	58,3
	Vichy	4	8,0	33,3	91,7
	Seba-Med	1	2,0	8,3	100,0
	Total	12	24,0	100,0	
Missing	System	38	76,0		
Total		50	100,0		

Table 41. The third brand for fifth important customer requirement relative to the other three brands

Rank of AVON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	3	6,0	27,3	27,3
	Avon	5	10,0	45,5	72,7
	Vichy	2	4,0	18,2	90,9
	Seba-Med	1	2,0	9,1	100,0
	Total	11	22,0	100,0	
Missing	System	39	78,0		
Total		50	100,0		

Table 42. The second brand for fifth important customer requirement relative to the other three brands

Rank of DSM is 2 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	8	16,0	44,4	44,4
	Avon	7	14,0	38,9	83,3
	Seba-Med	3	6,0	16,7	100,0
	Total	18	36,0	100,0	
Missing	System	32	64,0		
Total		50	100,0		

Table 43. The worst brand for fifth important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

For the sixth customer requirement ranks are shown from table 44 to Table 47.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	9	18,0	45,0	45,0
	Avon	4	8,0	20,0	65,0
	Vichy	4	8,0	20,0	85,0
	L'Oreal	1	2,0	5,0	90,0
	Seba-Med	2	4,0	10,0	100,0
	Total	20	40,0	100,0	
Missing	System	30	60,0		
Total		50	100,0		

Table 44. The best brand for sixth important customer requirement relative to the other three brands

Rank of DSM is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Avon	7	14,0	53,8	53,8
	Vichy	4	8,0	30,8	84,6
	Seba-Med	2	4,0	15,4	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 45. The third brand for sixth important customer requirement relative to the other three brands

Rank of AVON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	3	6,0	37,5	37,5
	Avon	4	8,0	50,0	87,5
	Vichy	1	2,0	12,5	100,0
	Total	8	16,0	100,0	
Missing	System	42	84,0		
Total		50	100,0		

Table 46. The second brand for sixth important customer requirement relative to the other three brands

There is no brand as rank two

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Avon	5	10,0	38,5	38,5
	Vichy	6	12,0	46,2	84,6
	Seba-Med	2	4,0	15,4	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 47. The worst brand for sixth important customer requirement relative to the other three brands

Rank of VICHY is 1 relative to other three brands

For the seventh customer requirement, ranks are shown from table 48 to Table51.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	7	14,0	31,8	31,8
	Avon	1	2,0	4,5	36,4
	Vichy	9	18,0	40,9	77,3
	L'Oreal	1	2,0	4,5	81,8
	Seba-Med	4	8,0	18,2	100,0
	Total	22	44,0	100,0	
Missing	System	28	56,0		
Total		50	100,0		

Table 48. The best brand for seventh important customer requirement relative to the other three brands

Rank of VİCHY is 4 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	1	2,0	10,0	10,0
	Avon	4	8,0	40,0	50,0
	Vichy	4	8,0	40,0	90,0
	Seba-Med	1	2,0	10,0	100,0
	Total	10	20,0	100,0	
Missing	System	40	80,0		
Total		50	100,0		

Table 49. The third brand for seventh important customer requirement relative to the other three brands

Rank of ACON is 3 relative to other three brands

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	3	6,0	23,1	23,1
	Avon	6	12,0	46,2	69,2
	Vichy	3	6,0	23,1	92,3
	Seba-Med	1	2,0	7,7	100,0
	Total	13	26,0	100,0	
Missing	System	37	74,0		
Total		50	100,0		

Table 50. The second brand for seventh important customer requirement relative to the other three brands

Rank of DSM is 2 relative to other three brands.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSM	3	6,0	27,3	27,3
	Avon	5	10,0	45,5	72,7
	Vichy	2	4,0	18,2	90,9
	Seba-Med	1	2,0	9,1	100,0
	Total	11	22,0	100,0	
Missing	System	39	78,0		
Total		50	100,0		

Table 51. The worst brand for seventh important customer requirement relative to the other three brands

Rank of SEBA-MED is 1 relative to other three brands

Brands with the biggest percentage for each table from Table 24 to Table 51 were chosen and the competitive assessment table was constituted (Table 52). This table was used as competitive assessment part of House of Quality.

Customer requirement	**4**	**3**	**2**	**1**
Therapeutic effect should be revealed quickly	DSM	VICHY	AVON	SEBA-MED
Product should be a hypo-allergic	DSM	AVON	VICHY	SEBA-MED
Product should soothe the problem (before curing) at the first use	VICHY	AVON	DSM	SEBA-MED
Product should cure without including chemicals	DSM	AVON	VICHY	
Product's color and smell should not change after opening the package	VICHY	AVON	DSM	
Product should include traditional substance	DSM	AVON		VICHY
A product should have an instantaneous effect	VICHY	AVON	DSM	

Table 52. Competitive assessment

4.3 IMPLEMENTATION OF HOUSE OF QUALITY

Estimated impact and estimated cost were calculated by Exporter Company. Since cost is the confidential information of Finders International Ltd., Exporter Company indicates the estimated in percentage. Estimated cost shows the "% increase" of one product's cost if related design characteristic is changed according to customer requirements. Estimated impact refers the % increase of one product's profit from sales; if related design characteristic is changed according to customer requirements. Design characteristics and customer requirements matrixes were sent to Finders International Ltd. They compute target value, estimated impact and estimated cost according to these matrixes.

In order to show relationships between customer requirements and design characteristics a scale is used.

-2: strong negative relationship

-1: negative relationship

0: no relationship

1: positive relation ship

2: strong positive relationship

There is a strong relationship between Emollient and therapeutic effect of DSM Skin Softener. So "2" is put in interaction of the DSM Skin Softener related design characteristic and related customer requirement

Design changes were decided by using estimated cost and estimated impact. There are two reasons. First reason is that trade-off matrix is empty so there are no interrelations between design characteristics. This enables to make a decision more easily. Second reason is that this method are not required a special calculation. Roberta S. Russell and Bernard W. Taylor suggested this way (Russell and Taylor, 2002, pg 96).

If roof is not empty this method should not be used. Since the interrelation between design characteristics, this method gives wrong results. If there is interrelation between design characteristics, Kusiak suggested using software to make calculation easy (Belhe and Kusiak, 1996, http://www.icaen.uiowa.edu/~coneng/).

- For x and y variables ranges are determined. For example $a<x_i<b$
- $y_i=f(x)$ is calculated. Here, interrelations are coefficients of f(x)
- y_i max= f(a) and y_i min= f(b)
- Scaling is calculated. y=a+x(b-a)
- Scaled in (a, b) is calculated for x_i,
- The optimal solution is found for x_i and target values are set according to optimal solution.

Since I examine other simple solution method, this calculation is not examined detailed. For more information please refer Belhe and Kusiak, 1996, http://www.icaen.uiowa.edu/%7Econeng/lectures/CS5.pdf.

As I mentioned above, estimated cost and estimated impact were calculated in percentages. If estimated impact exceeds estimated cost, Finders International Ltd decides to change this characteristic's design. On the contrary, if estimated cost exceeds than estimated impact, Finders International Ltd decides to change this characteristic's design. Finders International gave formulation as percentage because of confidential issues. Also competitors' values were estimated in percentage. Since the formulation is secret of the company, to reach this information is too hard.

customer requirements	importance	Design Characteristics: Dead Sea Minerals	melert (softener)	Foaming Oil	Carrier (aqua)	emulsifier	Competitive Assessment: 1	2	3	4
Therapeutic effect should be revealed quickly.	7	1	2	0	0	0	SEBA-MED	AVON	VICHY	DSM
Product should be a hypo-allergic	6	1	-1	-1	0	-1	SEBA-MED	VICHY	AVON	DSM
Product should soothe the problem (before curing) at the first use	5	2	2	0	0	0	SEBA-MED	DSM	AVON	VICHY
Product should cure without including chemicals	4	2	-2	-2	0	0	SEBA MED	VICHY	AVON	DSM
Product's color and smell should not change after opening the package	3	0	0	2	0	2	SEBA MED	DSM	AVON	VICHY
Product should include traditional substance	2	2	0	2	0	0	VICHY		AVON	DSM
A product should have an instantaneous effect	1	2	2	0	0	0	SEBA MED	DSM	AVON	VICHY
DSM		0,01	0,6	0,26	0,12	0,01				
VICHY			0,555	0,3	0,12	0,025				
AVON			0,68	0,2	0,1	0,02				
SEBA-MED										
estimated cost		0,17	0,58	0,2		0,05				
estimated impact		0,2	0,2	0,25		0,06				
Target value		0,08	0,49	0,3	0,12	0,01				
Design changes		*		*		*				

Figure 9. House of quality DSM skin softener

Decisions for DSM Skin Softener

I. Dead Sea Minerals will be changed. Target value is 0.08. To reach this value estimated cost is 0.17, however estimated impact is 0.20. Since estimated impact exceeds estimated cost, percentage of Dead Sea Minerals will be increased from 0.01 to 0.08. Since DSM minerals will be increased therapeutic effect will increase and instantaneous effect will be increase. Moreover product will includes more traditional effect. So this change will satisfy customers these three requirements.

II. Film forming oil will be changed with a natural one and percentage will be increased from 0.26 to 0.3. Estimated impact, 0.25 exceeds estimated cost, 0.2. New oil will smell better. The result of this change will satisfy customer's three requirements which are "Therapeutic effect should be revealed quickly", "Product should cure without including chemicals" and "Product's color and smell should not change after opening the package".

III. Emulsifier will be changed with a natural one. . Estimated impact, 0.06 exceeds estimated cost, 0.05. The result of this change will satisfy customer's three requirement which is "Product should be a hypo-allergic".

IV. Film forming oil and DSM minerals were decided to change. So artificial emollient will be reduced to be more natural.

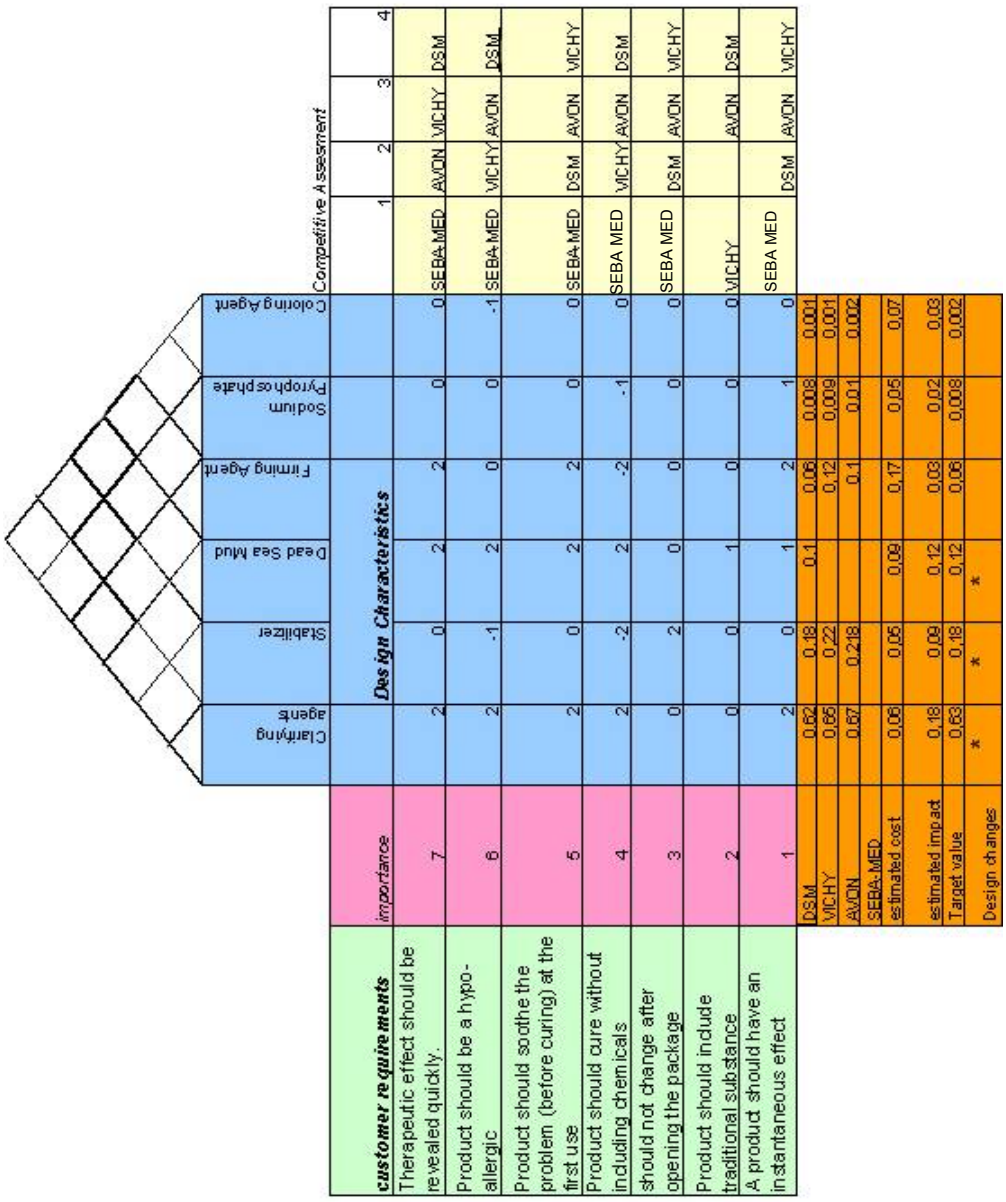

Figure 10. House of quality DSM active seaweed mask

Decisions for DSM Seaweed Mask

I. Clarifying agents will be increased. Target value is 0.63 estimated impact 0.18 exceeds estimated cost, 0.06. this change will satisfy customer

requirements which are “Therapeutic effect should be revealed quickly”, “Product should soothe the problem (before curing) at the first use and “A product should have an instantaneous effect”

II. Instead of stabilizer, Algin will be used. Algin is a natural stabilizer. Estimated impact of 0.09. This value exceeds estimated cost which is 0.05. Target value is 0.18.This change will satisfy customer requirements which are “Product should be hypo-allergic” and “Product should cure without including chemicals”

III. DSM minerals were decided to change. Target value is 0.12. Estimated impact is 0.12. This value exceeds estimated cost which is 0.09. So therapeutic effect of the product will be increase. This design change will satisfy customer requirements which are “Therapeutic effect should be revealed quickly”, “Product should soothe the problem (before curing) at the first use” and “product should have an instantaneous effect”.

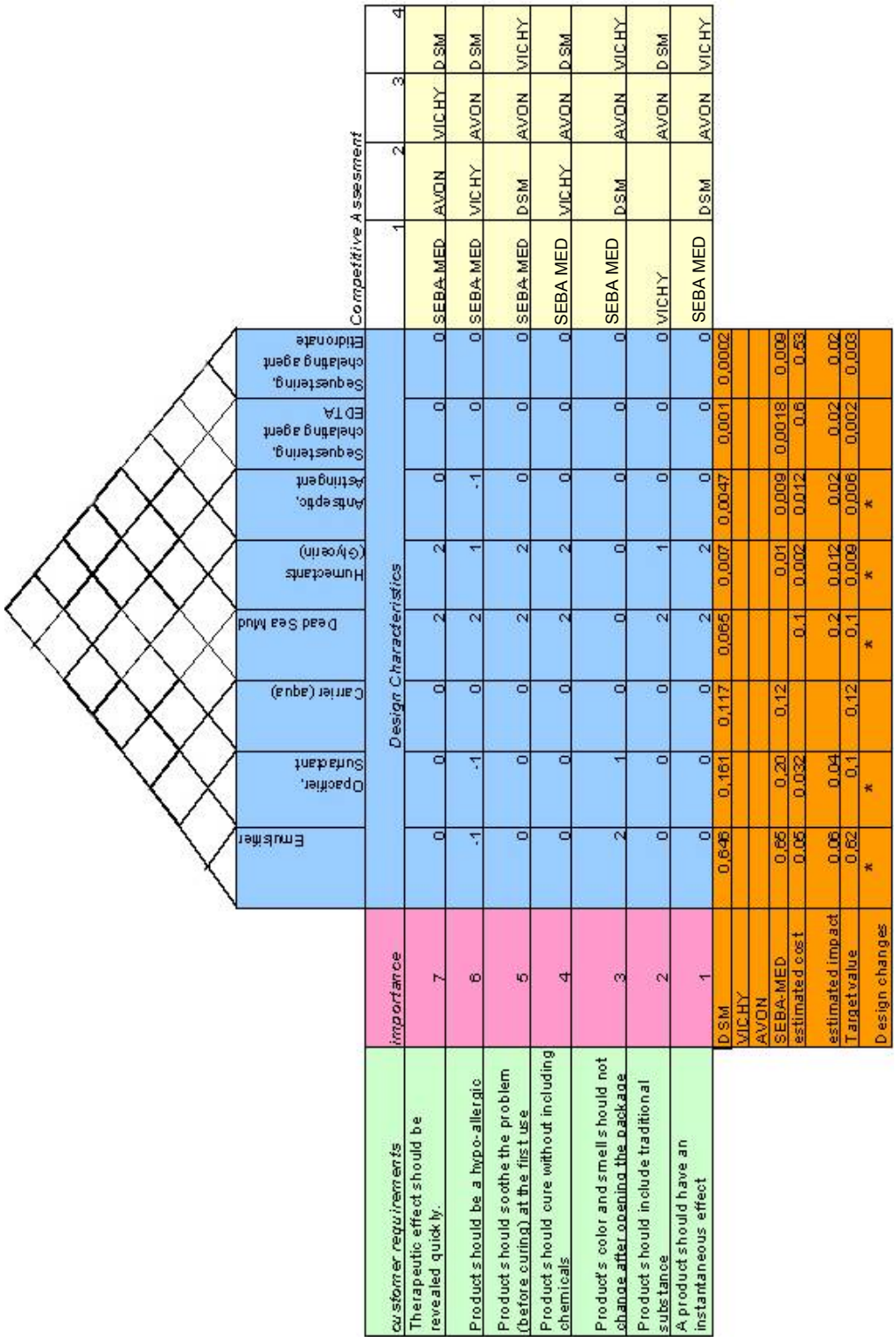

Figure 11. House of quality DSM black mud soap

Decisions for DSM Black Mud Soap

I. Instead of artificial, a natural emulsifier will be used. Target value is 0.62. Estimated impact of this change is 0.06. Estimated cost is 0.05. Since estimated impact exceeds estimated cost this design characteristic was decided to change. This change will satisfy customer requirement which is “Product should be a hypo-allergic”.

II. Instead of artificial, a natural Opacifier surfactant will be used. Since this material only show the skin more opal than it really is. So this ingredient will be reduced from0.161 to 0.1. Estimated impact of this change is 0.04; however the estimated cost is 0.032. This design changes will satisfy customer requirement which is “Product should be a hypo-allergic”.

III. Dead Sea mud was decided to increase. Target value is 0.1 instead of 0.005. Estimated impact, 0.2 exceeds estimated cost, 0.2. This change will satisfy customer requirements which are “Therapeutic effect should be revealed quickly”, “Product should soothe the problem (before curing) at the first use”, “Product should include traditional substance” and “A product should have an instantaneous effect”.

IV. Glycerin was decided to increase. Target value is 0.009. Estimated impact, 0.012 exceeds estimated cost, 0.002. This design change will satisfy customer requirements which are “Therapeutic effect should be revealed quickly” and “product should have an instantaneous effect”.

V. Instead of artificial antiseptic, natural one will be used and increased its percentage. Estimated impact of this change is 0.02. Estimated cost is 0.012. Estimated impact exceeds estimated cost. This change will satisfy customer requirement which is “Product should be a hypo-allergic”

Products with design changes are compared with rival products. Vichy's and Avon's skin softener products include more forming oil than DSM. This makes rivals products greasier. This is an advantage for DSM product. However rival products are more intense than DSM product. This causes quick finish relative to rival products. Rival products use artificial emulsifier to obtain more intense creams. This is an advantage for DSM product because DSM decided to use natural emulsifier. Moreover rival products do not have Dead Sea minerals which have therapeutic effect. DSM decided to use natural Algin in its face mask. Rivals do not have any product which contains Algin and mud simultaneously. DSM decided to reduce Opacifier and use natural one instead of artificial one. Rivals' soaps include high level of Opacifier. This shows the skin more opal than it is. Seba-Med's soap includes high level of antiseptic. DSM compensates this situation with using more Dead Sea mud. DSM soap cleans and purifies the skin with natural ways.

5. CONCLUSION

Cosmetic sector is very competitive. There are too many brands and too many products in the market. That is why, in order to gain competitive advantage, differentiation is very crucial. The companies should give importance to their customer requirement in order to survive in the market. By realizing required changes according to customer requirements, companies can gain market shares and competitive advantage. QFD is a system which enables a company to decide which required changes should be changed and allows them compare themselves with their competitors. Moreover the QFD study reveals customer requirements. Making a decision is very hard. This serious decision affect a company's everything such as its sales, image, profit and loss. Unsuccessful design change can cause too many losses. Related decision should be making in a serious method. QFD enables this serious method to companies. Especially small and medium scale companies generally do not have technical people. Usually industry engineers are involved with design changes. Unfortunately especially in Turkey small and medium scale companies do not have possibility to employ high qualified technical persons. QFD enabled me to make required decisions without high qualified technical person. QFD has a flexible calculation. If estimated impact exceeds estimated cost, related design characteristic is changed. QFD implementation study shows QFD is a suitable method to use in cosmetic sector, although there are some difficulties. These difficulties can be removed by a well established team. This study is a start for using QFD method in cosmetic sector in Turkey.

I had some difficulties when performing this study.

- The most important one was the quantity of brands on the market. There are more than thirty brands on the market and end users are not aware of all brands. This caused some defects when inquiries were filled out. That is why the competitive assessment part was relatively hard.
- The second difficulty was reaching the users of DSM products. Sales of DSM are very low. I reached very few DSM users. That is why the frame of the inquiry survey was expanded. Other cosmetic users were included in the survey. Inquiries were made with DSM retailers. However inquiries were made in retailers, the usage of DSM was computed at 17%.
- The third difficulty was reaching the formulations of rival brands. Since cosmetic products consist of formulations, these formulations are kept confidential.
- QFD method is a team work. I worked with pharmacist to examine design characteristics. Also I was helped by marketing and account departments. With a good team, removing these difficulties is possible.

The following additional conclusions have been reached about the survey

- Since my time was limited sample size and frame of the study was limited. If the sample size and the frame are expanded for Turkey market, inquiry results and QFD study will be more accurate.

- Because of the structure of cosmetic sector, there are too many competitor brands. It was very hard for me to reach all these brands' design characteristics. However reaching all these brands' design characteristics is easy for companies. Because these companies have more board marketing teams. So they can conduct competitive assessment part for QFD more easily.
- Because of the characteristic of cosmetic product, design characteristics of cosmetics do not have Interrelations between ingredients. This enables small and medium scale companies to make more easy decisions. That is why implementation of QFD is easier relative to other sectors.
- With the development of the cosmetic sector in Turkey, difference between cosmetic products and derma cosmetic products will be more evident. So competitive assessment will be easier.
- Some difficulties I came across were not caused by to be inappropriateness of QFD for cosmetic sector. These difficulties were caused by the limited time and study frame.

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APPENDICES

APPENDIX A: CUSTOMER INQUIRY

UNIVERSITY OF ECONOMICS
GRADUATE SCHOOL
MBA THESIS
CUSTOMER REQUIREMET INQUIRY

1-Age…

2-What is your monthly income?

□ 400YTL-600YTL

□ 601YTL-800YTL

□ 801YTL-1000YTL

□ 1001YTL-1200YTL

□ 1200YTL-1400YTL

□ 1400 YTL+

3- What is your monthly cosmetic expense?

□ Lower than 100YTL

□ 100-200

□ 201-300

□ 301-400

□ 400 +

4- Please write the products you use most?

……

5-Please write brands you prefer most?

……

6- Which derma cosmetic or cosmetic brands are in quality in your opinion?

……

7- In your opinion, why these brands are in quality?

……

8- Please sort expressions below according to their importance. Put 1 the most important expression for you and then continue with 2, 3…

□ Therapeutic effect should be revealed quickly

□ Product should have a nice fragrance

□ Product should include traditional substance

□ Product's color and smell should not change after opening the package

□ Product should be a hypo-allergic

□ Product should cure without including chemicals

□ Product can be used in different ways

□ Product should have a package design which does not cause wrong us or quick finish

□ Product should soothe the problem (before curing) at the first use

□ Product can be used for a long period.

□ The package should not be spoiling for a long period

□ Frequency use should not be necessary to reveal therapeutic effect

□ A product should have an instantaneous effect

□ The package design should be slightly

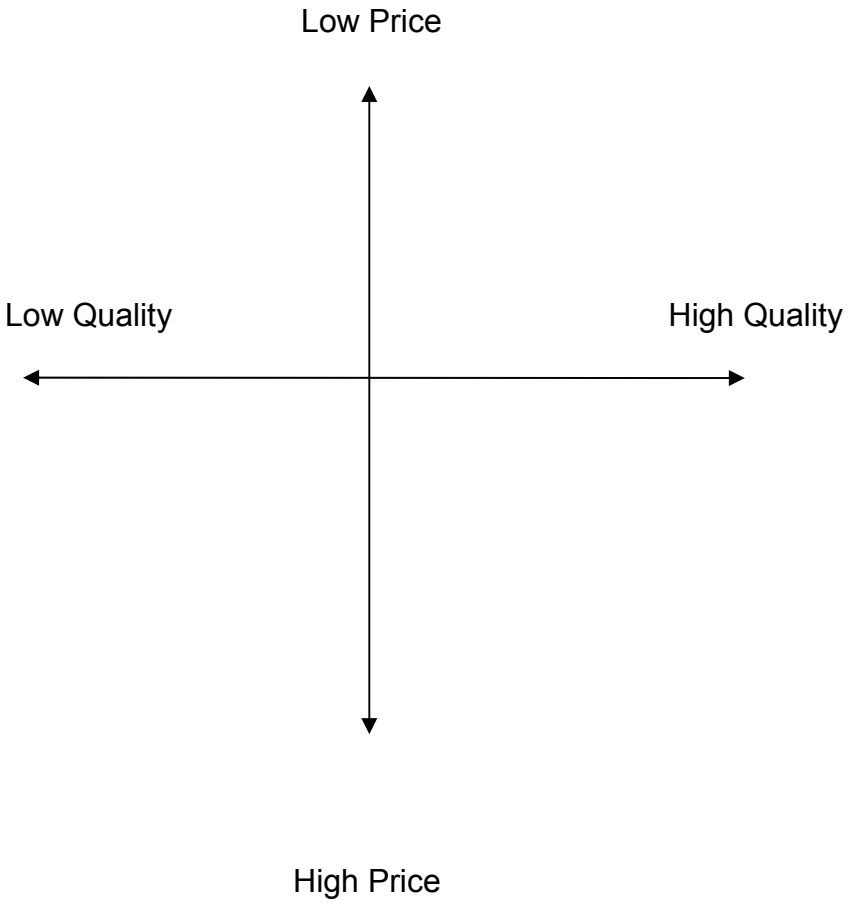
□ The package and the product should have an easy use

□ Other ……

9- Please compare four brands you mentioned above, according to expressions on question 9. Please write 4 for the best brand and write 1 for the worst brand

Therapeutic effect should be revealed quickly				
Product should have a nice fragrance				
Product should include traditional substance				
Product's color and smell should not change after opening the package				
Product should be a hypo-allergic				
Product should cure without including chemicals				
Product can be used in different ways				
Product should have a package design which does not cause wrong us or quick finish				
Product should soothe the problem (before curing) at the first use				
Product can be used for a long period				
The package should not be spoiling for a long period				
Frequency use should not be necessary to reveal therapeutic effect				
A product should have an instantaneous effect				
The package design should be slightly				
The package and the product should have an easy use				
Other				

10- Please place brands you see quality, relative to DSM



Thanks

APPENDIX B : LETTER FROM FINDERS INTERNATIONAL

Neslihan Akınay Anıl

Kimden: "Turklab" <turklab@turklab.com.tr>
Kime: "Neslihan Akinay" <neslihan@turklab.com.tr>
Gönderme tarihi: 25 Aralık 2006 Pazartesi 11:16
Ek: Finders Xmas Card 2006.pdf
Konu: Fw: Finders New Year

From: Robert Czik (Robert)
To: Sahin Yaglidere
Cc: Kate CZIK (Kate) ; Alan Jenner (Alan) ; Chris Stroud (Chris)
Sent: Friday, December 22, 2006 2:59 PM
Subject: Finders New Year

Dear Yaglidere

We are nearly finished the 2005 year and your company has done well - you have purchased £XXX from us in 2006 and I would like to thank you for this business.

We have great plans for 2007 by improving our Brand design and the formulations. In the formulations we are taking out the Parabens and adding Natural Organic ingredients - this will make the marketing story a lot stronger and I hope it will help with our consumer message.

Please thank all your team for achieving good results and tell them that our New Year resolution is to have More Planning, More Cooperation, More Sales.

Wishing you all the best and looking forward to working with you in 2007

Best regards

Robert, Kate, Alan and all of us at Finders

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