

# A focused team approach for teaching Product Development

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## Abstract

A practical method with a sound theoretical background proves to be useful for teaching product development to the MBA students. QFD (Quality Function Deployment) method provides a collaborative insight into the realities of product development process. Students that are equipped with the basic knowledge of product development are then grouped to form several product-focused teams. They decide on the “product” and the process begins. The usual steps in forming a HOQ (House of Quality) are followed in a strict manner. At the end of the group sessions, the HOQ presentations of products are made by each group and discussed with the audience. Several examples of HOQ’s produced in this workshop are illustrated as well.

## Introduction

It is known universally that theory is essential for any branch of science. On the other hand, theory is meaningful only whenever it can be applied successfully. Without theory no working practice could be created. Especially in an environment of human-interaction systems the importance of applicability becomes even more important because of the rapid-changing nature of the variables and parameters of the subject area. While students learn basic principles of management during their undergraduate studies they don’t get much chance of making practice on the subjects they learned. This is quite natural from the teacher’s side because one cannot really build practical knowledge on a field without gaining solid theoretical background on the same field.

It is quite likely that graduate students in a MBA course expect to acquire more practical and state-of-the-art knowledge than the theoretical elaborations of the subject like they did when they were undergraduates, i.e. more practical, easy to understand, ready to use knowledge in a specific area rather than the general descriptions of subjects in the vast and diverse contingents of the management field. Product development is one such area in operations management where one should sleeve off his shirts and get into business to really learn the basics of how it’s done. The crucial point is that it can only be achieved in a structured way and in a self managing team. Hopefully there is a good conventional method to administer these activities and to accomplish this unenviable task. It is the Quality Function Deployment (or briefly as QFD) developed in Japan by a group of scientists led by Yoji Akao in the late sixties and early seventies.

## The Process of Product Development

Product development is one of the few areas which intersect nearly every operation in the enterprise. It involves purchasing staff because they are in contact with the suppliers and should procure the incoming materials in the exact quality that they are supposed to be. Marketing is involved in the process because they interact with the customers and they have the relevant and most up-to-date information. Customer relations or customer service is in it because they know the complaints and should feed them back. Quality Assurance also interferes with the subject because they have the quality standards of the product and make sure that the process is free of pitfalls and errors. Manufacturing is responsible for the making of the product exactly what the design of the product requires. Finally, product designers wait for the guidelines according to which they are expected to create a product design which will both satisfy the customers and have a high degree of manufacturability on the other hand. QFD is a method that integrates all these information into one fundamental design which satisfies all the counterparts in and outside of the enterprise.

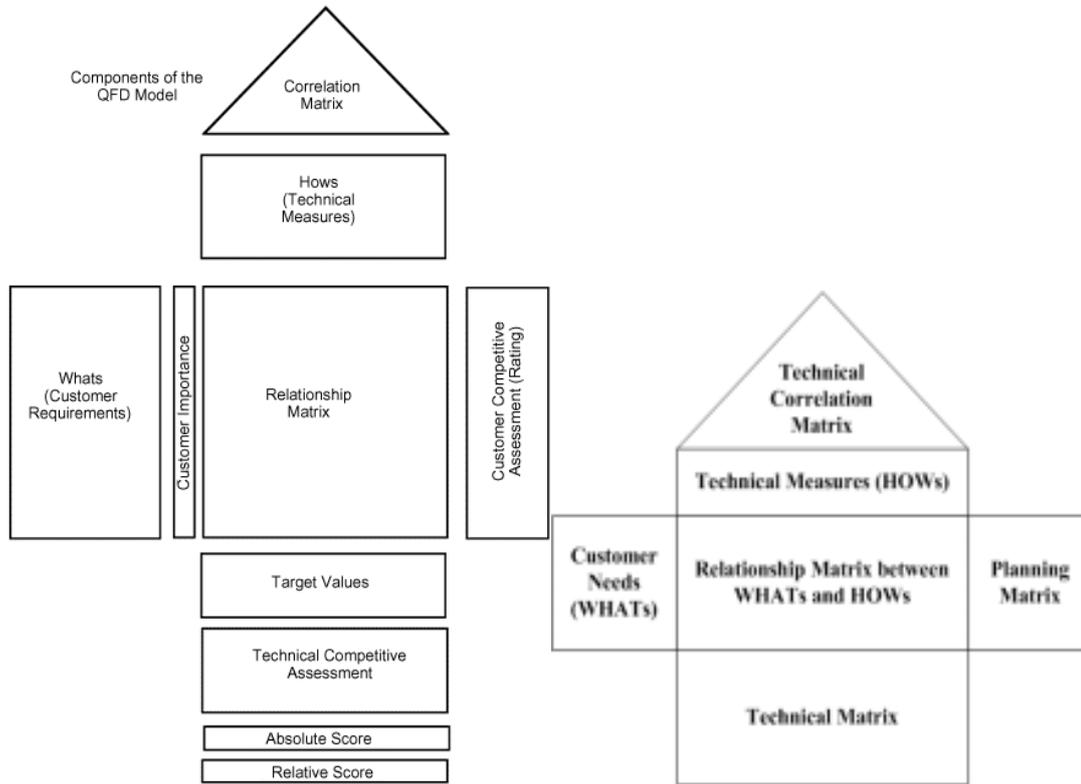
Consequently we can sum it up by a deduction that product development is a project in its own right which is composed of a series of related and inter-connected activities which can only be learned by experiencing the inherent atmosphere of the process.

### **The Method: QFD**

QFD is one of the useful quality tools that are applied in many diverse industries to fulfill customer needs and improve customer satisfaction (Sullivan, 1986; Hauser & Clausing, 1988; King, 1989; Akao, 1990; Bossert, 1991; Day, 1993; Clausing, 1994; Shillito, 1994; Cohen, 1995; Terninko, 1997; Chan & Wu, 1998, 2002). QFD has been used across a wide variety of product and service applications including training/education, software development, healthcare, automotive manufacturing, electronics, information technology systems and policy implementation (e.g. Zairi, 1993; Cohen, 1995; Tan et al. 1998). Examples of products and services that have been developed using QFD are: cars, computers, cameras, consumer products, office equipment, paints, diagnostic instruments, tools, apartment layouts, retail outlets, airline services, retirement plans, movie theatres, health insurances, financial services, telephone services, gas and electrical services, distribution networks (Griffin & Hauser, 1993; Hauser & Clausing, 1988).

By employing this methodology, numerous Japanese companies enabled their product development efforts to more effectively focus on meeting customer needs, thus building a distinct competitive advantage. The successes in Japan helped US companies lead to the adoption of QFD in the early 80's. Literature states that QFD has reduced design time and has led to dramatic success stories: reductions in overall project costs (e.g. 50%), reductions in project cycle time (e.g. 33%), and major increases in productivity (e.g. 200%) (Guinta & Praizler, 1993).

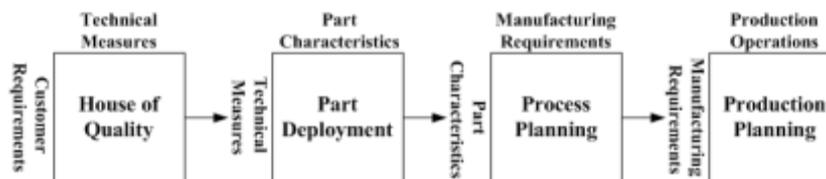
Research has found that QFD can provide some short-term benefits such as reducing the cross-functional barriers associated with product development teams and aiding changes in corporate culture. However, over the long-term, QFD has been shown to address the more tangible benefits of reduced cycle time, reduced development cost, and increased productivity (Guinta & Praizler, 1993). An important benefit of QFD has been its effectiveness in capturing, prioritizing and stabilizing customer requirements. As with many business practices, the manner in which QFD is implemented will likely have a significant impact on the benefits derived (Griffin, 1992). Team commitment to the methodology is an important success factor (Griffin, 1992). Detailed discussion of the benefits of QFD can be found in many textbooks and papers (e.g. Zairi, 1993; Sullivan, 1986). The major benefits of using QFD are documented in several sources (Sullivan, 1986; Hauser & Clausing, 1988; Griffin, 1992; Hauser, 1993; Govers, 1996).



**Figure 1.** A detailed 'House of Quality'

**Figure 2.** House of Quality

QFD is a powerful tool for gathering all the information essential for product design. It was used to a great extent in the automotive industry in the past three decades and it is applicable to service industry as well as the manufacturing industry. It basically creates a common pool for the product information and does this in a precise, systematic and robust manner. House of Quality (or briefly as HOQ) is the backbone of the QFD method (see Figure 1). In fact QFD is a process which is made up of a series of HOQ's. For the sake of simplicity, we will adhere to the first HOQ schema as the usual practice in teaching and learning QFD. In the HOQ, as shown in Figure 2, six major steps are required to complete this matrix: (1) customer needs (What's), (2) planning matrix, (3) technical measures (How's), (4) relationship matrix, (5) technical correlation matrix, and (6) technical matrix. The traditional QFD is composed of four phases (or matrices), as depicted in Figure 3: product planning, parts deployment, process planning, and production planning. QFD is a well organized and structured method and has certain steps with clearly defined actions (see Table 1) .



**Figure 3.** Four phases of Quality Function Deployment

1. Voice of the customer	What are the needs and wants of your customer?
2. Customer perception	In the eyes of your customers, how well is your company doing versus your competitors?
3. Voice of the company	What are the technical measures that will relate to your customers' needs?
4. Correlations	What are the relationships between the voice of the customer and the voice of the company?
5. Technical comparison	How does your product performance compare technically to your competitors' products?
6. Trade off's	What are the potential technical trade off's?

**Table 1-** Basic questions to be answered in creating House of Quality

### Course design

The product development is a one-semester three hours a week course in our MBA program at the Social Sciences Institute of Marmara University. Students come from many diverse fields in social sciences, namely management, economics, econometrics, and statistics or engineering. Almost all of them are working during daytime and follows the classes in the evenings. Having had product management knowledge in marketing, such as brand management, customer loyalty, market segmentations et al. the only missing knowledge they have is the more technical side of the subject, in other words the product design process. The production/operations management approach to the subject deals with the product planning, product & process design and manufacturing phases in general. Service after sale is also included in the product development process.

The workshop is a "hands on" and interactive one designed to address both theory and practice of QFD. QFD is a systematic methodology focused on understanding and deploying the "voice of the customer" into every aspect of the product and service offering; thereby, increasing the customers perception of value. Embedded in the QFD process, the HOQ provides a template used to prioritize and correlate articulated customer needs with associated product specifications and competitor performance. The workshop provides a step-by-step process to extract customer needs obtained through brainstorming. Subsequently, the workshop leads participants through the application of customer information to evaluate competitive offerings and synchronize product offering with expectations of the market. Participants thereby learn the activities behind the completion of each portion of the HOQ and apply proven techniques to interpret the information; evaluating customer needs, assessing competitive position and identifying areas of new opportunity to drive the customer's perception of value.

Participants "learn by doing" as they are facilitated through the application of each key subject. Since it is planned to satisfy the needs of the practitioner; participants learn and apply the important aspects of the process to their products. At the conclusion of the course, participants should have a clear understanding of the overall QFD methodology as well as complexities associated with effectively planning for, and executing, the HOQ as an integral part of a product development project. A course manual is provided to participants as well as a list of reference material. The course manual included illustrative examples of HOQ taught during the workshop.

At the beginning QFD-related concepts such as target customers, expected quality, expressed quality, attractive quality, design quality, customer satisfaction are taught in detail. The method is then introduced and explained step-by-step on an illustrative example. After five 3-hour classes the students are split into five-member groups. Each team holds its

meetings in a separate room for the next 3 or 4 weeks. Course lecturer takes the role of facilitator and be present in some of the meetings. At the end of this period teams are ready for the presentation of their works having produced their own HOQ's.

Presentations are made and discussed in front of the whole class with almost everyone making contribution by either asking a question or expressing opinion. Usually one or two groups complete their presentations at one evening depending on the total number of groups; a figure between 3 and 6. Three weeks are reserved for the presentations and discussions therefore it makes 12 weeks altogether to complete the course.

### **The pitfalls**

Certainly there are hard times to come over especially when the groups first adjourn. Some students are more of technical side and the others are not. We make sure that there will be at least one or two technical persons in each team so as to keep the balance of the group. This kind of fine adjustment is done when splitting the class into 3-6 groups. Another important milestone is the selection of product. Students are advised that at least one person in the team must know the product very well. Most complaints arise from this choice. They are told that some may not know the product technically, but if they use the product is something in their daily life there will be no problem because they will consider themselves in place of the customers. That's what we call "to be in the customer's shoes". So they are encouraged to take more active part in their group discussions.

There is no magic rule of creating the best formation of groups. Some groups work more effectively than the others while some groups have conflicts among members. It is quite healthy for a group to have some dissidents but this shouldn't make team's work come to a halt. Facilitator intervenes and solves the conflicts at this point.

It is an unusual experience to observe the separately located (preferably in separate rooms) groups brainstorming, discussing, disagreeing, sometimes arguing but at the end coming to a compromise; it all happens in a time span of 3-4 weeks. The inevitable one-week time space between classes may have caused losing the enthusiasm at the beginning but this was overcome by the class attendants keeping the momentum always up. It's true that the professional groups attend two or three day QFD seminars in successive days but in our case this one-week interval helps students to study the theory and prepare for the group discussions.

### **The merits**

Teams realize certain accomplishments such as sustaining productive teamwork, to have a better understanding of product development, gaining hands-on experience, to learn creative thinking, to think of themselves in the shoes of customers etc. The presentations also have proved to be fruitful from many aspects. Students learn a lot from the discussions of HOQ examples. Especially technical correlations are the most debated issue.

We carried out a small survey limited to the participants of this workshop, i.e. team members who actually did the HOQ charts. We contacted them several weeks after the course is finished and 12 participants replied the questionnaire. The outcome is as follows: The biggest gain from this experiment was found to be that this approach made them understand the subject easily. Second most important gain was to understand the relationship of customer demands to product requirements. Another notable gain for the participants was the newly introduced notion of perceiving the product as a customer (see Table 2). What was the biggest problem or hardness encountered in this experience? The drawbacks participants stated were as follows (in order of importance); inadequacy of QFD knowledge and technical knowledge, insufficiency of time available, group conflicts, product selection (see Table 3).

What was the biggest gain?	Number of marks	Percentage	Rank
helped me to understand the subject very practically	9	50%	1
made me understand the relationships between customer needs and technical requirements	6	33%	2
taught me to look at the product from customer's eyes	2	11%	3
lifted our team consciousness	1	6%	4
it was entertaining!	0	0%	?
did no contribution at all!	0	0%	?

**Table 2-** The distribution of type of problems encountered during workshop

In this workshop participants learn to relate every aspect of the product development phase to customer demands which is the backbone of QFD. Benchmarking competitors' products by customer perception is a good example of this. At the end, the decision to select a certain feature of the product to be improved is another example. All in all students leave this experience well-equipped with a clear idea of what product development is all about. But perhaps the major benefit is that it gets people thinking together on the same issue of interest.

### **Achievements and drawbacks of Workshop**

QFD workshops have produced some very good examples ranging from track shoes or a jacket, wallet, mobile phone, or a pizza to umbrella. The only missing example might be referred to as the HOQ for any kind of service product.

After finishing the course, a survey was carried out as mentioned before to collect the opinions of the participants about what they learned from the course and the problems they encountered. Some of the results have been already documented (see tables 2 & 3). Most important finding was that 75 per cent of the participants thought that QFD in general was very useful to them while only one said 'no' and two being neutral.

We asked one last question to know if they would apply QFD or HOQ to their work. The answers to this question were dispersed: 3 'yes', 1 'no', 4 'perhaps' and 4 'don't know'. This can be interpreted as an encouraging situation because a general positive understanding of QFD was created among them and under suitable circumstances they would never hesitate to apply the HOQ (I use this term because within this short time limit and under 'artificial' conditions instead of 'real-life' situations no one would expect the participants getting much deeper into QFD than the first HOQ.)

What was the biggest problem or hardness you had?	number of marks	Percentage	Rank
inadequacy of QFD knowledge	6	37,5%	1
inadequacy of technical knowledge	4	25%	2
inadequate time available	3	18,75%	3
group was not in harmony	2	12,5%	4
product selection was wrong!	1	6,25%	5
didn't know the product well	0	0%	6

**Table 3-** The distribution of problems encountered during workshop

### Conclusion

QFD is the most enhanced and up-to-date method to correlate customer needs to the technical attributes of the product. It provides an excellent platform where you can build the knowledge on customer-focused product development. For a MBA course it proves to be an ideal method for teaching because it provides a framework for the student learning by practice to perceive the product from customer's eyes. The extraordinary thing about QFD is that it provides the suitable environment for a newcomer to learn the happenings of a product development process it is like the experiment in the chemistry lab. You observe, take part, listen, put your ideas forward and see the result.

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