

Translating the Student's Voice into Teaching Techniques: A Quality Function Deployment Approach

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Abstract

Quality Function Deployment (QFD) is a planning tool used to fulfill customer expectations. It is a disciplined approach to product design, engineering, and production and it provides in depth evaluation of a product requirements. An organization can improve technique of delivering engineering knowledge implementing QFD techniques. The main goal of this paper is to translate the student's voice into teaching techniques applying QFD approach. For this purpose a questionnaire based survey is performed in an Engineering department to sort out the student requirements. From the collected data, a house of quality is developed and finally prioritizes the teaching techniques corresponding to the student requirements. The higher the relative weight of the technique, the more the concentration needed. Any Engineering discipline can use the QFD tool to improve their teaching techniques.

Keywords

Student's voice, quality function deployment, house of quality

1. Introduction

In today's business environment, any organization that wishes to exceed customer expectations and stay competitive needs a long-range strategic plan. This plan must be forward-looking, visionary and achievable, while at the same time striving toward continuous improvement of the organization's key business processes. The organization must, in effect, keep "both hands on the wheel" to move forward successfully [1]. Quality Function Deployment (QFD) is a structured approach defining customer needs or requirements and translating them into specific plans to meet those needs. The "voice of the customer" is the term to describe these stated and unstated customer needs or requirements. The voice of the customer can be captured in a variety of ways: direct discussion or interviews, surveys, focus groups, customer specifications, observation, warranty data, field reports, etc. This understanding of the customer needs is then summarized in a service planning matrix or "House of Quality (HOQ)". These matrices are used to translate higher level "what's" or needs into lower level "how's" - service requirements to satisfy these needs [1]. Recently, QFD tool has been implemented in the educational system [2], health care system[3], academic planning [4] etc. In a cognitive sense, education itself is a process of converting tangible resources into intangible resources. The "product" of education is often intangible and difficult to measure because it is reflected in the individuals in their knowledge, their characteristics and their behavior. Practically speaking, teaching techniques should help individuals developing creative, critical and perceptive ways of thinking so that they have the ability to define, formulate and solve problems independently or co-operatively. Teaching techniques does not only concentrate on individual profession but also it makes an intellectual development which should have life- long impact on individuals [5].

Quality Function Deployment helps to maintain a correct focus on true requirements and minimizes misinterpreting customer needs. As a result, QFD is an effective communications and a quality planning tool [6]. However, this study approaches to translate the student's requirements into teaching techniques and to rank the teaching techniques by making HOQ using the QFD approach. In this research, analysis is based on the Industrial and production engineering department (IPE) of Shahjalal University of science and technology (SUST). To assess the competitive position of the service, the adapted QFD methodology also incorporates a student assessment section in the HOQ. Serviceability of IPE department is compared with Civil and Environmental Engineering department of the same

faculty of SUST. QFD team which consists of seven student and one course teacher has collected data by surveying from the students.

2. Quality Function Deployment and House of Quality [4]

The translation process uses a series of matrixes that is called House of Quality shown in Fig-1, to study, analyze the relationships, to prioritize the importance, and the trade-offs between various factors (student requirements). The steps followed to make this house of quality are explained in the next section.

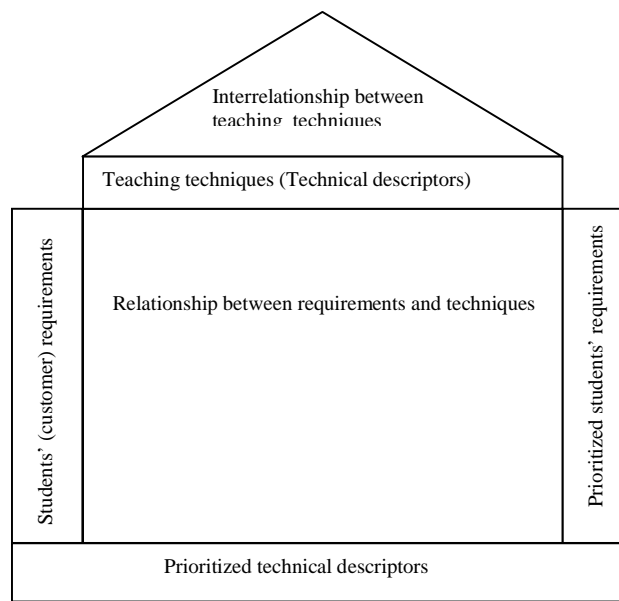


Figure 1: Model of house of quality for this study

3. Application of QFD in Education

For analyses, QFD implementation is done according to House of Quality. The steps for preparing the house of quality shown in Figure 2 are explained below:

Step 1-list of the student requirements (WHATs): Quality Function Deployment starts with a list of requirements of the students. This list is often referred as the WHATs that a student needs or expect in a particular service. The voices of the students are collected by surveying from one hundred twenty students. The students are fourth year second semester, fourth year first semester, third year first semester and ex-students of this department. Twenty two student's requirements have been listed. The key requirements of the students are listed in the House of Quality.

Step 2-list of the teaching techniques (HOWs): The goal of the house of quality is to design or change the design of a service in a way that meets or exceeds the student expectations. The student's needs and expectations have been expressed in terms of the student requirements, the QFD team must come up with service element or teaching techniques (HOWs) that will affect one or more of the student requirements. The information on teaching techniques was collected from students. Each techniques of teaching must directly affect a student perception and are expressed in measurable terms. QFD team summarized the suggestions and combined different technique and the number was reduced. Then the summarized teaching techniques were incorporated in the House of Quality.

Step 3- develop a relationship matrix between WHATs and HOWs:

The next step in building a house of quality is to compare the student requirements and teaching techniques and determine their respective relationships. Tracing the relationships between the student requirements and the teaching techniques can become very confusing, because each requirement may affect more than one teaching techniques, and vice versa. For this reason, the relationship is divided into three categories – strong, medium and weak

relationship. And if there is no relationship the intersection quadrant is remain blank. The relationship has been completed by QFD team.

Step 4-develop an interrelationship matrix between HOWs:

The roof of the house of quality, called the correlation matrix, is used to identify any interrelationships between each of the teaching techniques. Symbols are used to describe the strength of the interrelationships. A solid circle represents a strong positive relationship, a rectangle represents a positive relationship, an X represents a negative relationship and a star represents a strong negative relationship. This interrelationship matrix is prepared by the QFD team.

Step 5-competitive assessments:

The competitive assessments have been done by focus group (five numbers of teachers) of Civil and Environmental Engineering department (SUST) using average rating.

Step 6-develop prioritize students (customer) requirements:

The prioritized student (customer) requirements construct a block of columns corresponding to each student's requirements in the house of quality on the right side of the HOQ Matrix. These prioritized student requirements contain columns for importance to student, target value, scale-up factor, service point, and an absolute weight.

Importance to customer:

A focus group ranks each customer (students) requirements by assigning it a rating. Numbers 1 through 10 are listed in the importance to customer (student) column to indicate a rating 1 for least important and 10 for very important. In other words, the more important the students' requirements, the higher are the rating.

Target value:

The target value column is on the same scale as the customer competitive assessment (1 for worst and 5 for best). This column is where the QFD team decides whether they want to keep their service unchanged, improve the service, or make the service better than the competitor.

Scale-up factor:

The scale-up factor is the ratio of the target value to the service rating given in the customer competitive assessment. The higher the number, the more effort is needed. Here, the important consideration is the level where the service is now and what the target rating is and deciding whether the difference is within explanation.

Service point:

The service point tells the QFD team how well a student requirement will serve. The objective here is to promote the best student requirement and any remaining student requirement that will help in the service. Here, the service point is a value between 1.0 and 2.0, with 2.0 being highest.

Absolute weight:

Finally, the absolute weight is calculated by multiplying the importance to customer, scale-up factor, and service point: $\text{Absolute weight} = (\text{Importance to customer}) * (\text{Scale-up factor}) * (\text{Service point})$.

Step-7- develop prioritized teaching techniques (technical descriptor):

The prioritized technical descriptors contain degree of technical difficulty, target value, and absolute and relative weights. The QFD team identifies technical descriptors that are most needed to fulfill student requirements and need further improvement.

Degree of difficulty:

The degree of the technical difficulty helps to evaluate the ability to implement techniques to fulfill student's requirement. Here a difficulty rating (1 to 10 point scale, ten being very difficult and risky) for each subsystem / subassembly / part requirement or technical characteristic.

Target value:

This is an objective measure that defines values that must be obtained to achieve the technical descriptor. How much it takes to meet or exceed the students' expectations is answered by evaluating all the information entered into the house of quality and the selecting target values.

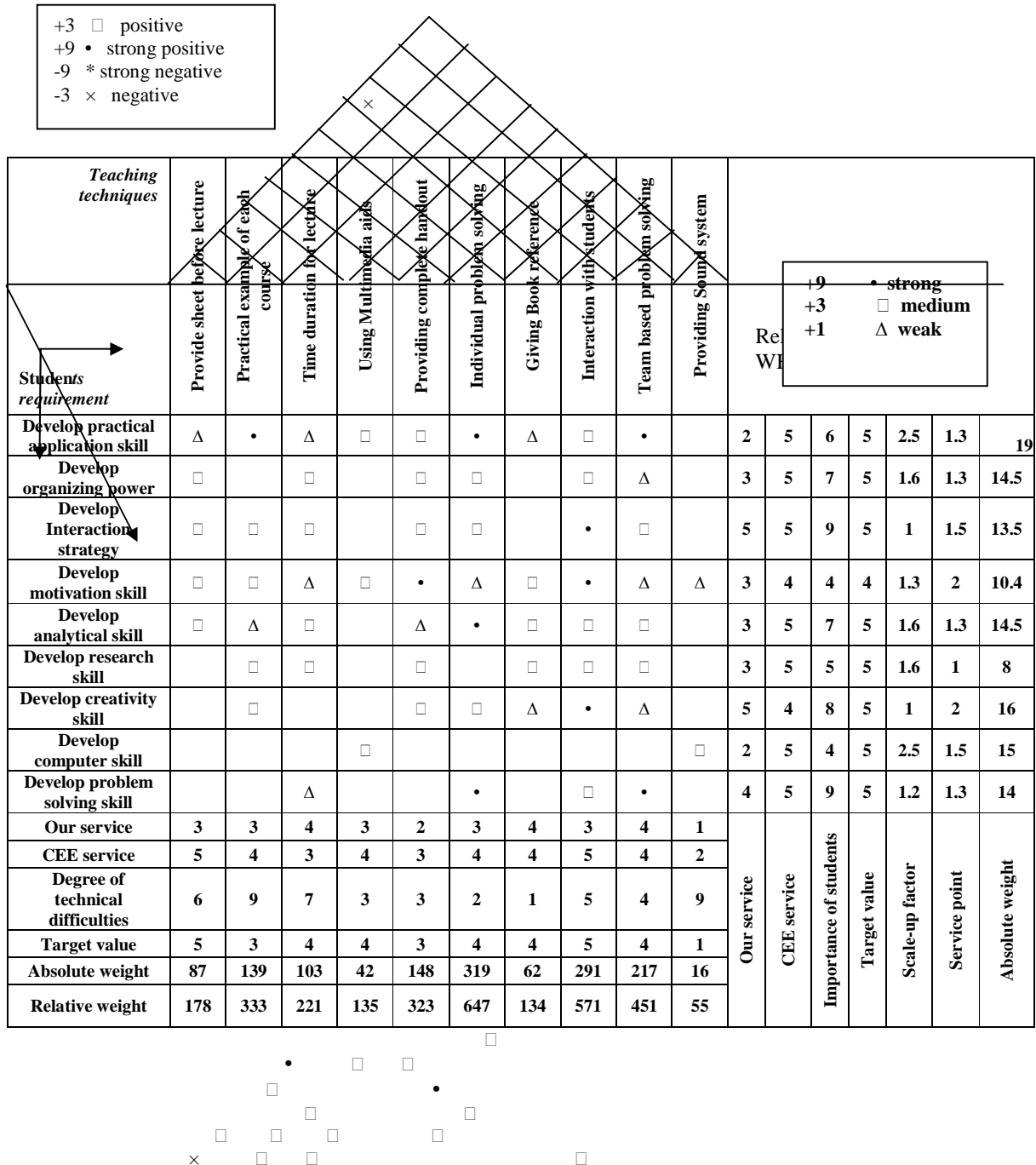


Figure 2: Final QFD table (house of quality)

Absolute weight:

The last two rows of prioritized technical descriptors are the absolute weight and relative weight. Absolute weight for the *j*-th technical descriptor is then given by

$$a_j = \sum_{i=1}^n R_{ij} C_i$$

Relative weight:

In a similar manner, the relative weight for the *j*th technical descriptor is then given by replacing the degree of importance for the customer requirements with the absolute weight for the customer requirements.

$$b_j = \sum_{i=1}^n R_{ij} d_i$$

b = row vector of relative weights for the technical descriptors (*j*=1, 2...*m*).

d = column vector of absolute weights for the customer requirements (*i*=1, 2...*n*)

4. Results and Findings

The higher relative weight indicates giving the more concentration on the teaching techniques to satisfy the student's requirements. According the relative weight, the teaching techniques are summarized in the Table-1. This table could help the concerned department to take initiative to improve the teaching techniques.

Table 1: Ranking of teaching techniques according to student's requirements

Ranks	Teaching techniques
1	Individual problem solving
2	Interaction with students
3	Team based problem solving
4	Practical example of each course
5	Providing Complete handout
6	Time duration for lecture
7	Provide sheet before lecture
8	Using Multimedia aids
9	Giving Book reference
10	Providing Sound system

5. Conclusion

The adopted QFD methodology proved to be an effective tool for translating the student's requirements into teaching techniques in this research. Our studies and application of QFD is able to prompt the Faculty to view the teaching techniques from a quality perspective. In future, there are many potential areas for applying this methodology for example, student admission process, staff appraisal and promotion procedure, library books and materials acquisitions, etc. QFD can be a very powerful tool for the service operation.

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