# ACADEMIC MANAGEMENT AND IMPLEMENTATION OF THE QFD APPROACH

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***ABSTRACT***
*The utmost importance of education in the world today is universally acknowledged. Educational institutions in general and universities in particular are required to provide the quality education that fulfills the needs and expectations of students by enabling them to serve the nation and strengthen its economy. This study aims at unveiling the importance of QFD to the design and improvement of quality of the Management Sciences (MS) program by identifying the vital factors that need to be implemented and enhanced in a university to match the requirements or needs of students. The methodology used is the QFD matrix developed from the voice of enrolled/non-enrolled students in ten universities of Rawalpindi, Islamabad.*

## INTRODUCTION

Students are the nation's builders. The nation needs engineers, doctors, managers and scientists who will not only fulfill the nation's dreams but also benefit human beings and society. These nation builders require of government and society to provide the best possible educational system which is the epitome of quality, which not only meets their requirements and desires but also fulfill the national requirements. This era of economic competition requires higher educational institutions to provide quality education for the development of the economy. The different economic sectors which include industries, agriculture, manufacturing, services, etc., want universities to prepare their students according to industry requirements so that they can be placed in their respective industries. This in turn requires the universities to assure and improve their quality, to be adaptable so as to create a match between industry requirements and university offerings, to be positive and responsive to changes and to have the ability to deliver services that match customer requirements. Thus it is important to narrow the gap between internal quality and external customer satisfaction which identifies the customer expectations (Lin, 2007).

Pakistan has witnessed a boom in higher education in the past few years since the Higher Education Commission (HEC) has opened the gates to great opportunities in this sector. This has initiated an educational movement which inspired the youth of the country to seek higher education. HEC has created great opportunities for them by providing student scholarships and by providing funds for improvement of universities. Now it is high time for universities to scrutinize the requirements of students and needs of industries and enhance their role by attracting students to their campuses.

## THE PURPOSE OF THE RESEARCH

This paper will explore the application of Quality Function Deployment (QFD) to the design and improvement of quality of the Management Sciences program in universities based on student requirements, and the extent to which the university can create a match between student requirements and technical requirements provided by the university. Moreover, the study will also identify the factors that need to be addressed to enhance the student learning experience.

The research objectives of this study are as follows:

1. To explore the possible application of QFD to the design and improvement of quality of the Management sciences program in University X based on the requirements or expectations of students for selecting the right university for pursuing their higher studies.

2. To determine the extent to which the universities realize the expectations and needs of the students and the steps they take to mold the academic specifications of the department by matching them with the needs of the students.

3. To identify the critical factors that need to be enhanced in order to improve the University MS program based on student expectations/needs.

## TOTAL QUALITY MANAGEMENT DEFINED

The concept of total quality management (TQM), which emerged a few decades ago, was aimed at ensuring customer satisfaction. It has been perceived as more of a journey rather than a destination (Quesada, 1999; Burati & Oswald, 1993). The 1990s saw an extensive implementation of this strategy the world over (Rad, 2006). The word quality has been defined as "fitness for use" (Juran, 1981), "conformance to standards" (Crosby, 1979) and "a predictable degree of uniformity and dependability at low cost" (Deming, 1986). Thus quality is what matches the customer expectations and needs with predefined standards and requirements (Flood, 1993). The extensive development of TQM with particular focus on customer satisfaction can be attributed to the work of these gurus. Corrigan (1995) defines TQM as a management philosophy that builds a customer-driven, learning organization dedicated to total customer satisfaction through continuous improvement and the effectiveness and efficiency of the organization and its process. This TQM phenomenon got highlighted due to the remarkable success of Japanese products compared to those manufactured in other countries. This very phenomenon, fortified by the Japanese concept of innovative approaches and quality management ensuring high quality at low cost, compels even organizations in the United States to reconsider their strategies in order to survive in the market ((Dobyns and Crawford-Mason, 1991 Garvin, 1988; Deming, 1986; Juran, 1981; Gitlow and Shelly, 1987).

## TOTAL QUALITY MANAGEMENT IN SERVICES AND IN ACADEMIA

TQM has become a globally acknowledged strategic force found to enhance customer satisfaction, foster greater employee focus and motivation, reduce defects rates and improve overall performance (Juran, 1988). The 1980s were marked by a great popularity of TQM in the health care industry. TQM is now acknowledged as a great solution to improve the efficiency and effectiveness of this industry. Now it is universally acknowledged that customer satisfaction is an important indicator of health care quality. Many hospitals are looking for ways to change the delivery of patient care through TQM (Garvin, 1988; Westphal *et al*, 1997; Schalk and Dijk, 2005). The use of TQM to ensure patient satisfaction is being perceived as greatly important for the successful operation of services in hospitals (Andaleeb, 1988; Yang, 2003; Chan *et al*, 2004). TQM has been very helpful in resolving many problems in health care organizations (Yang, 2003).

Similar to other industries, education calls for maintenance of quality with specific focus on innovation and change. With the passage of time this concept has become greatly popular in education as supported by the literature. The world today sees education becoming more and more competitive as commercial enterprises and being influenced by economic factors (Seymour, 1992). TQM's application has been found highly invaluable in education and has been found highly useful in enhancing the morale of students as well as faculty and staff. It also ensures delivering high quality services that meets customer requirements (Hansen, 1993; Cowless and Gilbreath, 1993).

Crosby's (1984) model, cited by Crawford and Shutler (1999), suggests a practical use of TQM in the educational environment. In order to satisfy the educational needs of students, there is a dire need for continuous improvement efforts in curriculum and delivery services. This perspective has facilitated in the identification of various root causes of failure in the system (Ali and Zairi, 2005). The literature in this regards highlights improvements in education for a lot of reasons (Thakkar *et al*, 2006;Temponi, 2005). Efficiency should be used as the main criterion to evaluate performance and this is possible when the principles of quality management are given the top priority in higher education to the satisfaction of all stakeholders like students, parents, industry, etc.

## TOOLS FOR QUALITY IMPROVEMENT

A large number of methodologies/tools of TQM are applied in different industries to improve quality. These include QFD (introduced by Shigeru Mizuno and Akao during the late 1960s), policy development by Ako (1991), process management, benchmarking, Deming cycle (Shewhart Cycle), seven management and planning/quality control tools and failure mode and effect analysis (FMEA).

## QUALITY FUNCTION DEPLOYMENT

Quality function deployment is a quantitative tool which aims at giving the top most priority to the needs /requirements of the customers into the process of product development .Moreover QFD has proven to be effective tool in managing product/services in various industries including Academia. It was introduced by Akao (1972) in Japan during the 1960s with focus mentioned above. Moreover it's a Matrix form of planning chart aims at translating the customer priorities for designing, manufacturing of goods and services (Guinta & Praizler, 1993; pun et al. 2000).Quality function deployment phenomenon focuses on designing the products according to the needs an expectation of the customers and then transforming into design targets while meeting all quality standards throughout the development cycle thus intended to enhancing the customer satisfaction (Akao&Mazur,2003;Gonzalez et al.,2003;Hauser&Clausing,1988).

Due to remarkable success of Quality Function Deployment in industry it has also been being applied in the higher educational institution since 1980s (Grant et al., 2002).It was used by many researchers like Jaraiedi and Ritz (1994), Clayton (1993), Lam and Zhao (1998) and Pitman et al. (1995). The research findings reflect importance of QFD for cost effectiveness, improving teaching process through keeping customer satisfaction as the yardstick. These studies were conducted in the following universities these are West Virginia University, Aston University and University of Hong Kong respectively. In addition it ,more studies were conducted in other universities as well and addresses the implementation of QFD in different perspectives .These studies were conducted by Krishnan and Housmand(1993), Seow and Moody (1996), Chang and Ku(1995) , Ermer(1995) and Murgatroyd(1993). QFD was used by Krishnan and Housmand(1993) in order to meet expectations of customers while designing the syllabus for engineering at the university of Cincinnati. Seow and Moody (1996) did the same for University of Portsmouth. Chang and Ku (1995) made the use of QFD to highlight the needs for

improvements in engineering and technical education in Taiwan. Ermer (1995) used QFD for analyzing the customer driven design requirements at mechanical engineering department, university of Wisconsin-Madison. Murgatroyd(1993) applied the QFD in distance learning education. (Ayse and Veli 2005; Aytac and Deniz 2005) used this tool for reviewing the curriculum of the Tyre Technology Department. The study of Marvin E. Gonzalez et al. (2007) further strengthens the use of QFD in designing the SCM academic curriculum. The study of baba Md et. al (2009) also implemented the QFD approach for identification of the critical service quality characteristics in Malaysian firm. In nutshell the great success of QFD by all these researchers strengthen the prodigious implementation of this tool has got elevating the present standards of education in the universities thus making them fulfill the needs of students as well. This study can also be of great significance for developing countries like Pakistan where getting higher education with quality teaching and research is the need of time.

## METHODOLOGY

QFD is the method proposed for the design and improvement of the Management Sciences program in University X based on student requirements and benchmarks obtained from its competitor University Y. The primary planning tool used in QFD is the House of Quality. The following are the steps of QFD as shown in Figure 1.

**Step-1** This is the first step to begin the QFD process where the university seeks to capture the needs and expectations of the students. The voices of the students are taken from the Maguad, B.A (2009) with addition of one more student requirement by other i.e. Reasonable Fee. These Students requirements are verified by collecting the data through questions, in depth interviews, and focus group discussions with students who are enrolled in different universities in M.Phil and PhD. Following are the student's requirements; reasonable fee, qualified faculty, research opportunities, state of Art technology and solid academic program and Comfortable environment.

**Step-2** deals with the technical requirements that are associated with the student's needs and expectations Maguad, B.A (2009). These includes the number of PhD faculty in the department, number of computers labs in the departments, class room facilities, number of research publications by the faculty and professional accreditation.

**Step-3** This step is relationship matrix showing the level of association/influence between each student needs and each technical requirement the university is providing. These correlation coefficients are calculated and represented in the form of symbols which are further quantified by the numbers to show the strength of association.

● = 9 (Strong association)
○ = 3 (Somewhat association)
Δ = 1 (Weak association)

**Step-4** This step being the roof of the house of quality shows inter-correlations between technical requirements provided by the university. The purpose of calculating inter-correlation between them is to show that whether there is association or supporting behavior or conflict between each of the technical requirements. These correlation coefficients are calculated and represented in the form symbols which are further represented by the numbers to show the direction and the strength of association.

● = 9 (Strong association)
○ = 3 (Somewhat association
Δ = 1 (Weak association)
* = -3 (Negative association)

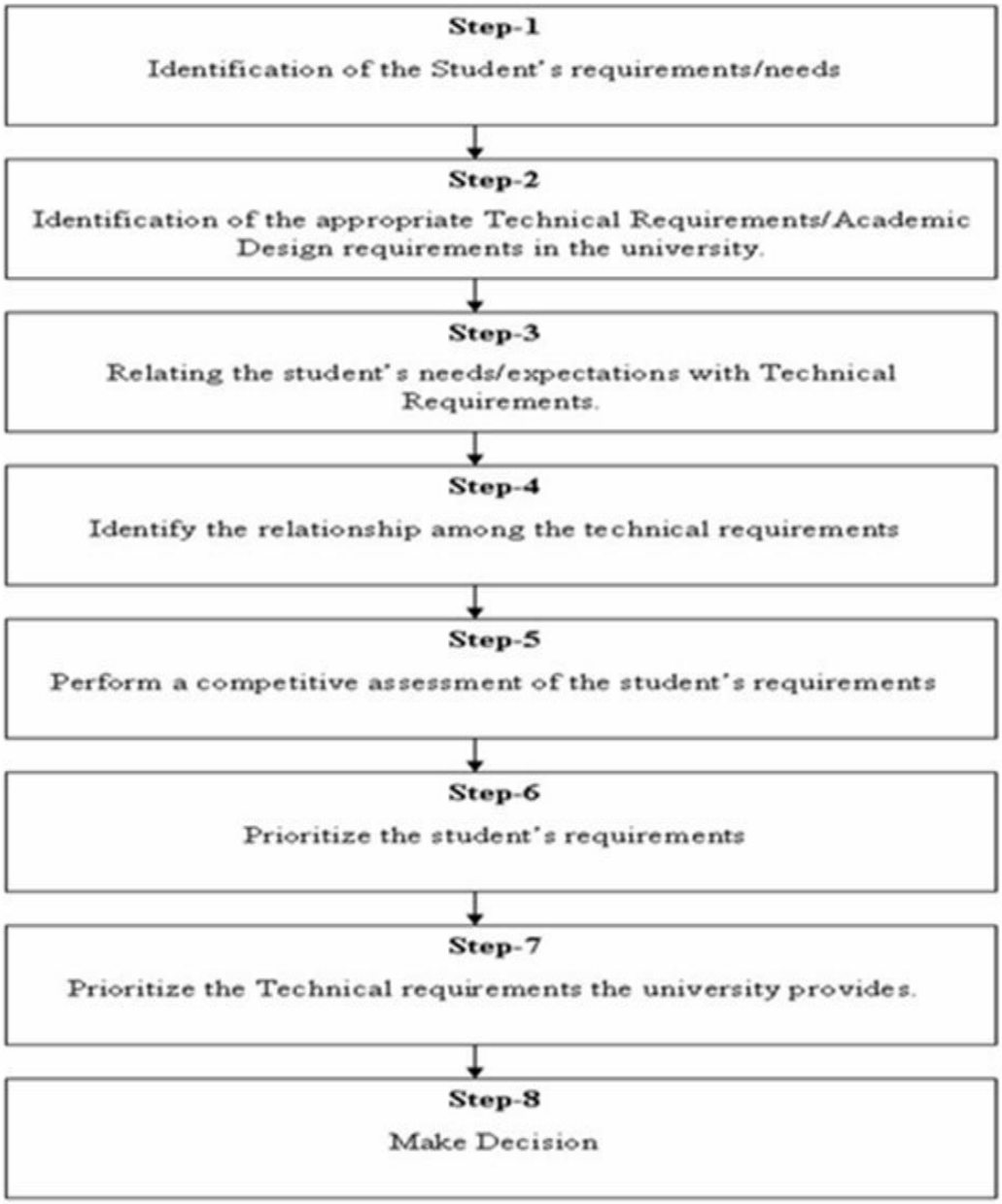


**Figure-1. Outline of the QFD Approach Applied**

**Step-5** This step performs the competitive assessment the student's needs and technical requirements. That is the university X compares its management sciences department with those of its competitors universities say Y and Z with respect to students needs and the technical requirements provided by the respective universities. These comparisons are made on the scale 1 through 5 with 1 indicating the 'Worst' while 5 for the 'Best'.

**Step-6** This step is a developing the prioritized students requirements corresponding to each of the student requirements. These are divided into columns of the house of quality i.e. importance to the customer, scale-up factor, target value, sale point and finally the absolute weight. In case of the importance to the customers for instance, the student's focus group assigns each of the student requirements by assigning a rating. These ratings are assigned 1 through 10 i.e. 1 indicating the least important to students while 10 for the very essential to students. Next is the target value which decides whether the university's Management Sciences department needs no change or needs improvement. Target values are set on the scale 1 through 5 with 1 "no change ", 3 "improvement is needed" and 5 "make it better than the competitor". The column of scale up factor is another important factor which is obtained by dividing the column of target value to the rating of university in the student's competitive assessment column. Here higher value of the ratio means there is difference between target value and student's competitive assessment and more the effort is needed. Simply where we are now and what is our target. Similarly the assessments of sale point are prepared by the members of the QFD team by indicating 1 as low sale effect and 2 indicating as high sale effect. Lastly, the absolute values were calculated by two ways as follows

Absolute Weight = (importance column)*(Target Value)*(Sale point)

Or Absolute Weight = (Importance to customer)*(Scale up Factor)*(Sale point)

**Step-7** This step deals with developing a prioritized technical requirements corresponding to each of the technical descriptors. This includes the technical difficulty level, relative and absolute weights. Here absolute weight is obtained for each of the technical requirements through the scalar product of the relationship matrix column and the importance to student's column.

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

$T_j$ =Absolute weight row vector for the technical requirement.

$R_{ij}$ =Strength of association assigned to the relationships matrix (i=1...n and j=1…m)

$C_i$ =Importance to the student's is column vector for the student requirements. (i=1…n)

$m$ =number of technical requirement and $n$ =number of Students requirement

The relative weights are found by calculating the sum of the products of the relationships between students and technical requirements and absolute weight of the student's requirements.

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

Where $S_j$ =Relative weights for the technical requirement row vector

$d_i$ = Absolute weights for the student's requirements column vector. (i=1…n)

## RESULTS AND DISCUSSIONS

The QFD technique was used for the design and improvement of the Management Sciences program in University X based on the requirements or expectations of the students for selecting the right university for pursuing higher studies and identifying the critical characteristics that need to be enhanced in order to improve the university's undergraduate student expectations/needs [The structure of QFD can be conceived as the main structure or framework of a house as shown in Figure 2.

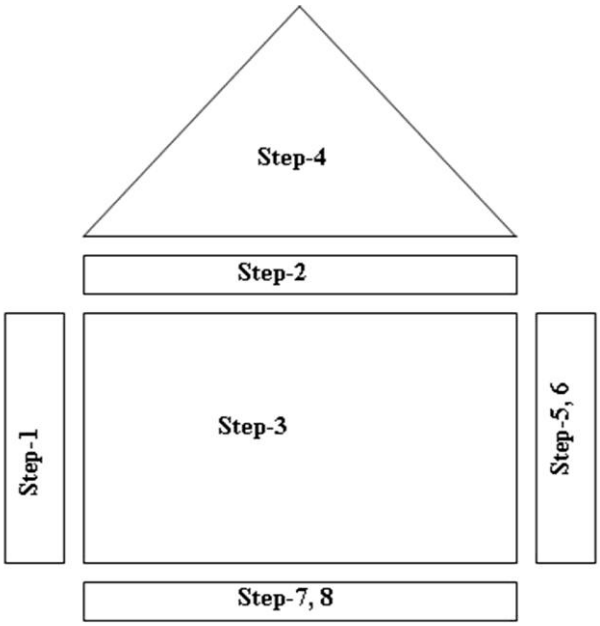


Figure-2 House of Quality

As shown in Figure 3, students want to have in their respective universities reasonable fee, qualified faculty, research opportunities, state of the art technology, a solid academic program and comfortable environment. Similarly the technical requirements the university should provide are the number of PhD faculty in the department, number of computers laboratories in the departments, classroom facilities, number of research publications by the faculty and professional accreditation.

The relationship matrix (Step-3) shows that the student requirement 'Qualified faculty' is strongly associated with the number of PhD faculty in the department and the research publications by the faculty. Similarly, research opportunities are strongly associated with the number of PhD faculty, publications by the faculty and the number of computer laboratories in the Management Sciences department**.** Moreover, comfortable environment and classroom facilities are strongly associated with each other. Other relationships can be seen in Figure 3**.**

The intercorrelation of the technical requirements (Step-4) shows that the Number of Ph.D. faculty is strongly associated with publications/research by faculty and somewhat associated with professional accreditation. Moreover publications by faculty are strongly associated with the number of PhD faculty and number of computer laboratories in the Management Sciences department. Other relationships can be seen in Figure 4.

Competitive assessment of student requirements (Setp-5) was done. It explained how the university's Management Sciences program was compared with those of its competitors with respect to student requirements and technical requirements. For example for University X the close competitors are university Y and Z. It may be noted that the student competitive assessment was constructed by assigning ratings for each customer requirements from 1 (worst) to 5 (best).

| STUDENTS REQUIREMENTS/ CUSTOMERR REQUIREMENTS | No. Of PhD Faculty | Class Room Facilities | Research Publications No. Of Publications by Faculty | No. Of Computer Labs in Dept. | Professional Accreditation | X | Y | Importance for Students | Target Value | Scale up Factor | Sale Point | Absolute Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Qualified Faculty | • | ▲ | • | O | O | 4 | 5 | 10 | 5 | 1.25 | 2 | 100 |
| Comfortable Environment | ▲ | • | ▲ | ▲ | ▲ | 3 | 4 | 7 | 4 | 1.33 | 1.5 | 42 |
| Research Opportunities | • | ▲ | • | • | O | 3 | 4 | 9 | 4 | 1.33 | 1.5 | 54 |
| State of Art Technology | O | O | • | • | O | 3 | 5 | 8 | 4 | 1.33 | 1.5 | 48 |
| Reasonable Fee | ▲ | O | ▲ | O | ▲ | 2 | 4 | 8 | 4 | 2 | 1 | 32 |
| Solid Academic Program | O | ▲ | O | O | • | 3 | 5 | 9 | 4 | 1.33 | 2 | 72 |
| Technical Difficulty | 7 | 3 | 6 | 5 | 6 | | | | | | | |
| Target Value | 5 | 4 | 4 | 5 | 5 | | | | | | | |
| Absolute Weight | 237 | 139 | 285 | 241 | 177 | | | | | | | |
| Relative Weight | 1820 | 844 | 2108 | 1656 | 1328 | | | | | | | |

Note: - Relationship Matrix
• = 9→Strong Relation
○ = 3 Medium Relation
Δ = 1 →Weak Relation

**Figure-3 QFD Matrix Analysis**

| ● = 9 (Strong association)<br>○ = 3 (Somewhat association<br>Δ = 1 (Weak association)<br>* = -3 (Negative association) | No. Ph.D faculty in MS dept. | Class Room Facilities | Publications by faculty | No. of Computer Labs | Professional Accreditation |
|---|---|---|---|---|---|
| **No. Ph.D faculty in MS dept.** | 1 | ▲ | ● | ▲ | ○ |
| **Class Room Facilities** | ▲ | 1 | ▲ | ▲ | ● |
| **Publications by faculty** | ● | ▲ | 1 | ● | ○ |
| **No. of Computer Labs** | ▲ | ▲ | ● | 1 | ● |
| **Professional Accreditation** | ○ | ● | ○ | ● | 1 |

**Figure-4 Roof of the House of Quality**

In Step-6 student requirements were prioritized and included importance for the students, scale up factor, target value, absolute weight and sale point. The importance rating for students by the Members of the QFD team is beneficial for prioritizing efforts and for making trade-off decisions. For example qualified faculty a student requirement was assigned a rating 10 considering the most important for the students seeking for MS admission. It means that the more the important the student requirement, the higher the rating. Evaluation of the assessment of each customer requirement helps determine the target value. In addition by setting a new assessment value that continue the product as it is, improves the product, or go beyond the competition. For the rating of PhD faculty is 4 and we want to improve it so we assign a target value 5.Moreover Scale up factor is also calculated which is obtained by dividing (ratio of the) target value to the product ranking given in the competitive assessment .The higher the scale up factor, the more the effort is needed. Here it means that level where the product is now and what the target rating is .Moreover in order to see the sale effect ,sale point assessment is made by the members QFD team representing the group on the scale of 1 or 2 where 1 represents low sale effect and 2 represents high sale effect. Qualified faculty and solid academic program were assigned sale point rating of 2 as they have high sale point effect. See Figure-3
Lastly, the absolute values were calculated by two ways as follows

Absolute Weight = (importance column)*(Target Value)*(Sale point)

Or Absolute Weight = (Importance to customer)*(Scale up Factor)*(Sale point)

For example absolute weight for the qualified faculty is 100, a research opportunity is 54 and solid academic program is 72 etc.

In this step (Step-7), QFD team here the group members identifies the prioritized technical requirement which contains the degree of difficulty, target value, and absolute and relative weights. Here we identify the technical requirements that are most needed to fulfill the customer requirements and needs improvement. Here technical difficulty is the degree for implementing

each technical/engineering requirement like number of PhD Faculty etc. as the PhD faculty is not easily available in the market in Pakistan so assigned rating 7 according to results we obtained. The basic purpose of the technical difficulty is to assess the ability of implementing certain improvement.

Moreover Absolute weight is found by calculating the sum of the products of relationship between customer and technical requirement and student importance column. It may be noted that the higher score of absolute and relative weights ratings spot the areas where technical/engineering efforts are needed to be focused.

For example, the absolute weight for the number of PhD Faculty is found as under
Absolute Weight of No. Of PhD. Faculty =

$$(9\times10)+(1\times7)+(9\times9)+(3\times8)+(1\times8)+(3\times9)=237.$$

The absolute weight of other technical descriptors can be seen in the Figure-3.
Similarly the relative Weight is found by calculating the sum of product of the relationship between customer and technical/engineering requirements and student/customer requirements absolute weight.

$$(9\times100)+(1\times42)+(9\times54)+(3\times48)+(1\times32)+(3\times72)=1820$$

The relative weights of other technical requirement can be seen from the Figure-3.

**Performance of the University X Relative to Its Competitor**

The quality performance for the university X is calculated as

Actual Performance of University = $\sum \quad (I*\sum R)*U_i$ where I = 1, 2

Where I = importance to the student requirement column

$\sum R$ = sum of the relationship matrix values between student needs and technical requirements

$U_i$ = University $i$ 's relative position column with respect to its competitor

Maximum Performance of the University = $(I*\sum R)*T$

Where I = importance to the student requirement column

$\sum R$ = sum of the relationship matrix values between student needs and technical requirements

$T$ = maximum target value column

The calculation method shown above has been adopted and modified from Arditi and Lee (2003) and Baba, M. D *et al* (2009).

**University X**

Actual performance of University X = 2643
Maximum required performance = 4242

Percentage performance level = $\frac{2643}{4242}*100$

= 62.30%

**University Y**

Actual performance of University Y = 3658

Maximum required performance = 4242

Percentage Performance level = $\frac{3658}{4242}*100$

= 86.23%

An analysis (Step-8) of the QFD matrix showed which technical requirement should be implemented by the university according to the voice of the students. For this purpose the absolute and relative weights were evaluated to determine what decision should be made on student needs and demands/requirements. From Figure 3 the house of quality showed that research publications by the faculty with a relative weight of 2108 had the highest importance followed by the number of PhD faculty with a relative weight of 1820. It could be inferred from the analysis that the university or the MS Department must focus on improvement in these areas. These findings are consistent with the study conducted by Maguad, B.A. (2009). Moreover it was interesting to see that the student requirement of 'reasonable fee' had the least absolute weight which showed that the students in Pakistan gave the least importance to reasonable fee with respect to other requirements like qualified and number of PhD faculty and research publications for pursuing their higher studies.

Additionally, performance evaluation calculations revealed that the university Y was performing better than University X with respect to satisfying the needs of students. So University X must improve the performance level keeping in view the implementation of the above mentioned factors in order to ensure their students are satisfied.

## CONCLUSION AND RECOMMENDATION

The utmost importance of education is universally accepted and cannot be denied. In turns it requires from the educational institutions and universities in particular to provide the quality education fulfilling the needs/demands of the students enabling them to really serve the nation thus strengthening the economy of the country. The universal recognition of QFD in education after industry highlights how important it is to raise the standards of education on universities in conformity with requirements of customers. Since the present study is concerned with exploration of the possible application of QFD to design and improve the quality of Management sciences program in University X based on the requirements or expectations of the students for selecting the right university for pursuing their higher studies. Moreover to find what factors the university should focus and to Identifying the critical factors that are needed to be enhanced in order to improve the University MS program based on the student's expectations/needs. The analysis of QFD matrix reveals that the factors Research publications by the faculty with the highest importance followed by the number of PhD faculty. It concludes that the university or MS Department must focus on improvement in these areas. In addition to it, it is surprising to see the least importance the students give to fee structure in comparison with the other factors like qualified, number of PhD faculty and research publications for pursuing their higher studies i.e. M.Phil and PhDs. The performance evaluation calculations reveal that the university Y (86%) is performing better than university X (62%) with respect to satisfying the needs of the students. So university X must improve the performance level keeping in view the implementation of the above mentioned factors in order to ensure their students are satisfied.

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