ISSN: 2321-7782 (Online)
ISSN: 2347-1778 (Print)
Volume 3, Issue 6, June 2015
International Journal of Advance Research in Computer Science and Management Studies
Research Article / Survey Paper / Case Study
Available online at: www.ijarcsms.com
Special Issue: 4th International Conference on Quality Up-gradation in Engineering, Science & Technology "IC-QUEST 2015"
Organized By: Bapurao Deshmukh College of Engineering, Sevagram, Wardha-442102, Maharashtra, India

Application of QFD for Enhancing the Competitiveness of Engineering Colleges

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Abstract: ***Most engineering institutions depends on a well-prepared curriculum from the academic point of view, and not on the basis of the views received from the industry. The academicians have always felt that the curriculum is their area of purview. Now the paradigm must change. The academicians need to interact with the industry and then only prepare the curriculum based on the needs of the industry and trade. That would mean a market research with the corporate on their expectations. Here it is not just the industry institution that is being proposed. What is proposed is a market research requirement that should be taken by the academicians with the industry to know what they are looking for from engineering graduates, and putting forth a curriculum to suit the corporate needs.***

Quality function deployment (QFD) is one of the Total Quality Management (TQM) techniques focused on delivering products & services that satisfy customers. It can be applied for process & design improvements. This paper explores the possible application of QFD to the design & improvement in various activities of the institutes leading towards improving their competitiveness.

Key words: Comprehensive QFD, TQM, Quality in Education, House of quality, rating, voice

I. INTRODUCTION

The engineering education of the new age should be in a position to assess the needs of the industry and educate mangers accordingly. Newer methods of manufacturing and newer business processes have been changing the way business in done. The old thumb rules are giving way to newer rules of the game, which keeps on changing. It is not possible for the academic world to teach what they think is right and still produce engineering graduates, which the industry wants to absorb. The engineering education should now come out of their shell and see what the industry requirements are.

The process of engineering education has to be looked at now in a very different manner. Ever institution is finally commercial in nature. Educational institutions are no exception. This may sound harsh, but the fact is that any educational institution, which cannot make profits, cannot sustain itself and continue on the good work being done by them. Therefore, there is no need to shy away from saying that education is also an industry. It is like any other industry that offers a certain service to the customers. This is not to undermine the lofty ideals of the institutions, but only to state that everyone need to make profits to enable them to continue the good work that they are doing. If education is commercial, the institutes are more akin like factories that produce services. Would it be proper to look at the educational institutions as factories that produce goods and services? The answer would be 'yes'. They are no different. The raw material used in a manufacturing plant can well be compared to the student intake in engineering education. The institution has been given the work of value addition to these new recruits to make them fit for the customer requirements, i.e. the industry, trade and the corporate world. The academicians now have to interact

with the industry to know their needs then develop a curriculum that suits the industry best. If an engineering education institute can be considered as a factory, then a whole range of new factors needs to be analysed. That means that the process of education is to be considered as a manufacturing process and we need to look at the efficiency and effectiveness of the process.

Quality Issues in Engineering Education:

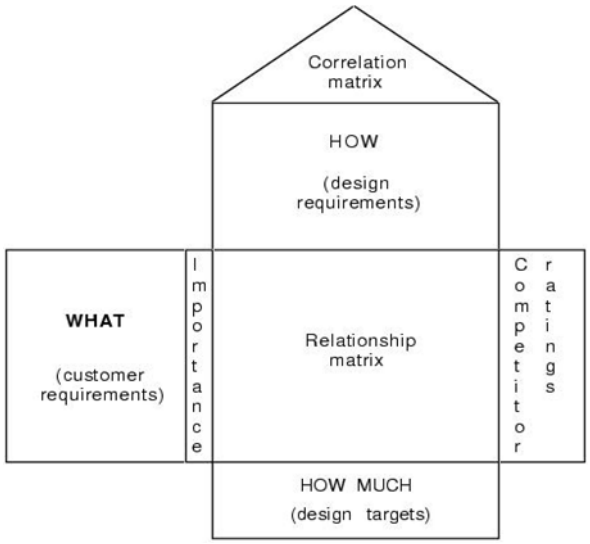
Quality is a complex, dynamic, historically constructed and multifaceted concept, often defined by what is lacking rather than by its contents. Creation of quality education is dependent on many parameters. Definition of these parameters & their objective measurement are critical in the assessment of quality engineering education. Some of the widely accepted parameters in this regard are- Intellectual capital, Infrastructure, Placements, Industry interface, Governance etc.

Quality function deployment(QFD) is one of the Total Quality Management(TQM) techniques focused on delivering products & services that satisfy customers. It can be applied for process & design improvements. An institute or a university justifies its existence by serving customers in meaningful ways. In order to be competitive, it must listen to them and work hard to meet their requirements. To accomplish this , the institute must first identify its customers, understand their expectations, and then serve them in meaningful ways. It must ensure that the voice of the customer is incorporated into the design & delivery of a product or service. The institute translates this voice into academic specifications that everybody in the school can understand and uses it to align its processes to meet the needs of its customers first time & every time. The use of QFD helps the institute to focus on priorities, provide better documentation and facilitate communication among everybody in the institute.

The House of Quality

QDF uses a set of matrices, often called the House of Quality, to translet customer requirements into a functional design. The first phase in the implementation of the Quality Function Deployment process involves putting together a "House of Quality" (Fig.1) such as the one shown below,

Fig-1:



Building the house of quality involves the following steps-

Step 1: Customer Requirements- "Voice of the Customer"

The first step in a QFD project is to determine what market segments will be analyzed during the process and to identify who the customers are. The team then gathers information from customers on the requirements they have for the product or service. In order to organize and evaluate this data, the team uses simple quality tools like Affinity Diagrams or Tree Diagrams. Answering the following questions may make the job easier-

 ISSN: 2321-7782 (Online) ISSN: 2347-1778 (Print)

» Who are our customers(both internal & external) ?

» What are the customer requirements ?

» "What are the important (qualities, characteristics, elements, features) of a good engineering institution?"

Internal customers- students, faculty, programs, technical & nonteaching support staff, guest/visiting faculties, Institute management & administration

External customers- employers(organizations),other colleges/universities, suppliers, Govt., community, regulating agencies, donors, aluminizes, newspapers, experts etc.

Customers requirements – This may be left to the institution to decide which customer groups to include in the survey & how to include them.The parameters which are expected by most of the customers are -Good learning ambiance, qualified faculties, excellent infrastructure, Good placements, excellent industry interface, state of the art technology etc.

Fig.2:

CUSTOMER REQUIREMENTS	
	Competent & Qualified Teaching staff
	Industry Placements
	Learning ambiance
	World class infrastructure
	State of the art Technology
	Industry Oriented updated curriculum
	Industry institute interaction
	Personality development(co-curricular & extracurricular) activities
	Low Course fee

Step 2: Regulatory/Design Requirements

Not all product or service requirements are known to the customer, so the team must document requirements that are dictated by management or regulatory standards that the product must adhere to. Compile list of design requirements (HOWS) necessary to achieve the market-driven whats. Each requirement should be quantified. Some of these requirements are -Number of teaching staff, qualification/experience of teaching staff, number of books/journals/computers/classrooms, faculty publications, student-teacher ratio , infrastructure, laboratory etc.

Step 3: Customer Importance Ratings: On a scale from 1-5, customers then rate the importance of each requirement. Cell strengths quantify the importance of each HOW to achieving each WHAT.

◉ Strong relationship

○ Some relationship

△ Weak relationship

No mark for no relationship

□ Negative relationship

Fig.3:

	Competent & Qualified Teaching staff	5					
	Industry Placements	5					
	Learning ambiance	4					
	World class infrastructure	4					
	State of the art Technology	3					
	Industry Oriented updated curriculum	4					
	Industry institute interaction	3					
	Personality development(co-curricular & extracurricular) activities	3					
	Low Course fee	2					

Step 4: Customer Rating of the Competition

Understanding how customers rate the competition can be a tremendous competitive advantage. In this step of the QFD process, it is also a good idea to ask customers how your product or service rates in relation to the competition. Determine how the customer perceives competitors' abilities to meet requirements i.e. Competition benchmarking. * Rate competitors on a scale of 1-5 with respect to each customer requirement. Best institute of the Region/state/country/continent etc. may be considered as our competitors.

Fig.4

Step 5: Technical Descriptors - "Voice of the Engineer"

The technical descriptors are attributes about the product or service that can be measured and benchmarked against the competition. Technical descriptors may exist that your organization is already using to determine product specification, however new measurements can be created to ensure that your product is meeting customer needs. The ratings on the importance column are based on a scale of 1to 5 with 5 being the most important. These ratings are assigned by a focus group of customers. Customer requirements that rank low on competitive assessments and high on importance are potential candidates for quality improvements. Target values are set on a scale of 1 to 5 where 1 is 'no change', 3 is 'improve the product' and 5 is 'make the product/service better than the competitors'. Decision on whether or not the product/service ought to be changed are based on target values. Eg.- Teacher-Student Ratio, Number of T/Staff/Ph.D.'s/computers/books/journals/research publications of T.Staff, placements etc.

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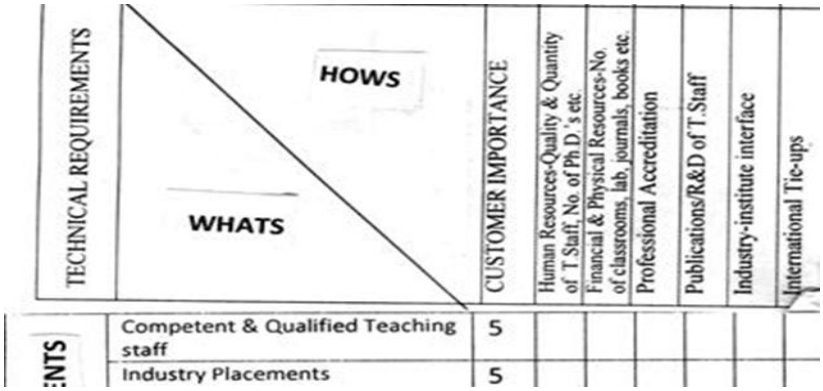
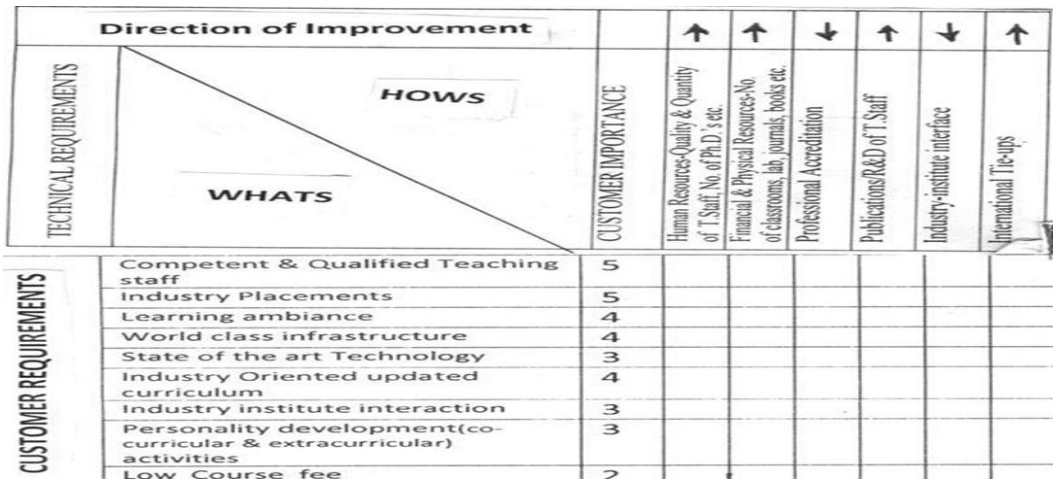
Fig.5:



Step 6: Direction of Improvement

As the team defines the technical descriptors, a determination must be made as to the direction of movement for each descriptor.

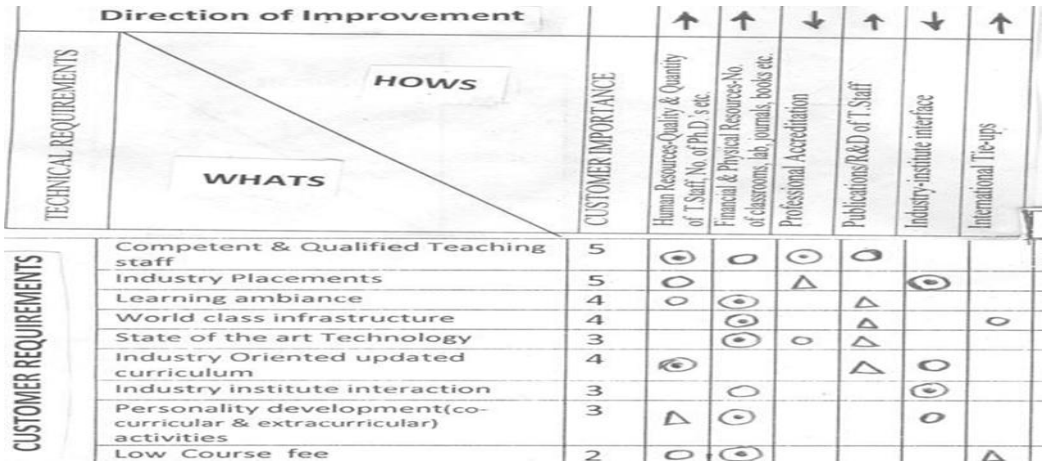
Fig.6:



Step 7: Relationship Matrix

The relationship matrix is where the team determines the relationship between customer needs and the company's ability to meet those needs. The team asks the question, "what is the strength of the relationship between the technical descriptors and the customers needs?" Relationships can either be weak, moderate, or strong and carry a numeric value of 1, 3 or 5.

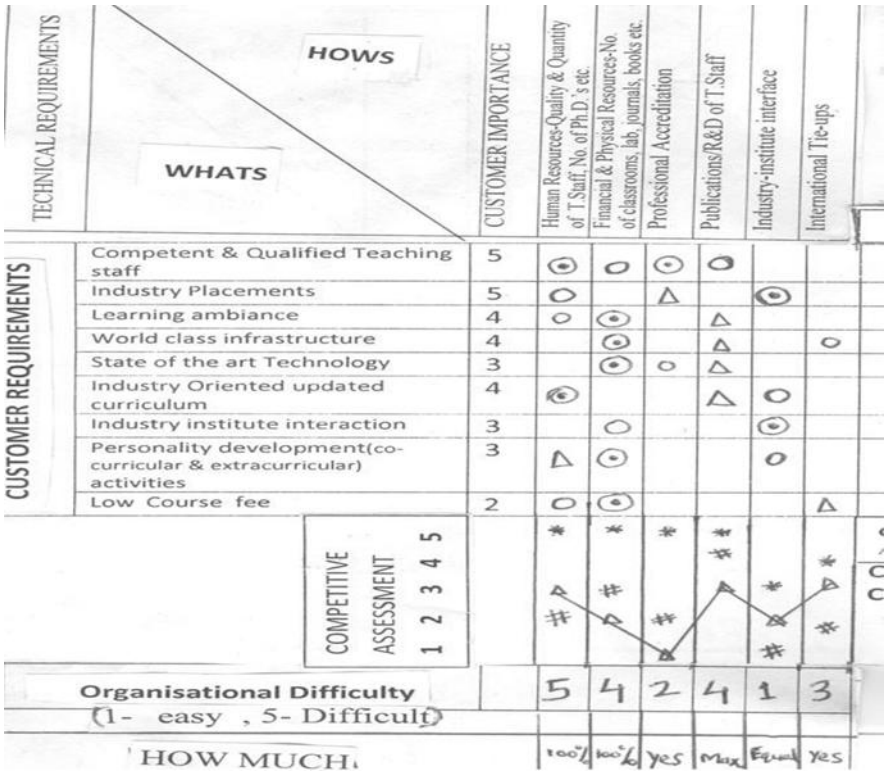
Fig.7



Step 8: Organizational Difficulty & Technical Analysis of Competitors-Rate the design attributes in terms of organizational difficulty**.**

Budgetary constraints, resources limitations, non availability of qualified T. Staff, remote location, non-supportive Govt. policies, etc. may be the part of organizational difficulties.To better understand the competition, engineering then conducts a comparison of competitor technical descriptors. This process involves reverse engineering competitor products to determine specific values for competitor technical descriptors.

Fig.8:



Step9: Target Values for Technical Descriptors

At this stage in the process, the QFD team begins to establish target values for each technical descriptor. Target values represent "how much" for the technical descriptors, and can then act as a base-line to compare against. The quantifiable parameters may be compared with the Best of the best institute & the same may be decided as a target values(Fig.8)

Step 10: Correlation Matrix

This room in the matrix is where the term House of Quality comes from because it makes the matrix look like a house with a roof. The correlation matrix is probably the least used room in the House of Quality; however, this room is a big help to the design engineers in the next phase of a comprehensive QFD project. Team members must examine how each of the technical descriptors impact each other. The team should document strong negative relationships between technical descriptors and work to eliminate physical contradictions.

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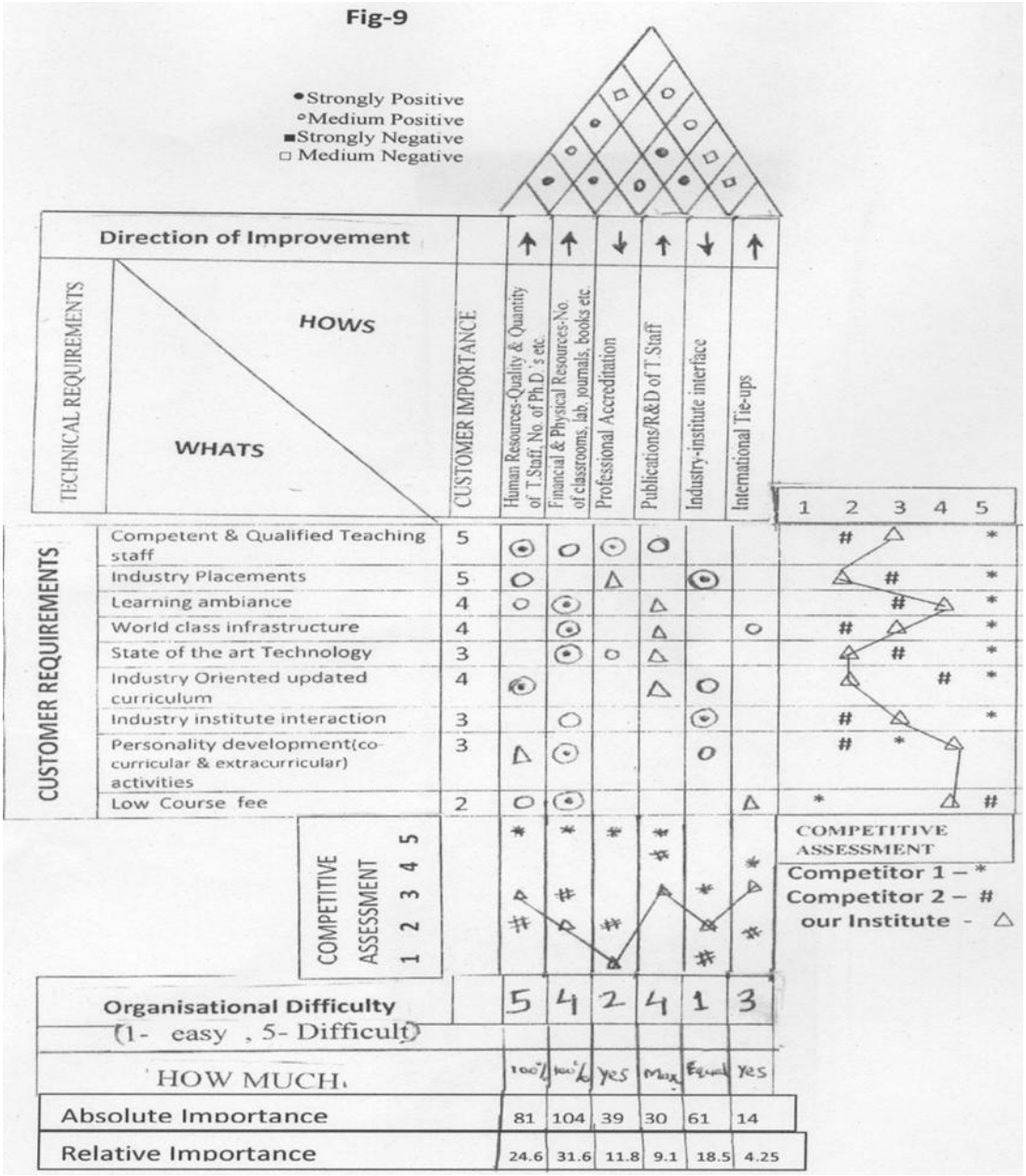

Now you know which technical aspects of your product/service matters the most to your customer! These gives the institute a focus for improvement in the near future.(Fig 9)

Step 11: Absolute Importance

Finally, the team calculates the absolute importance for each technical descriptor. This numerical calculation is the product of the cell value and the customer importance rating. Absolute rank is total of relationship value (quantify step 5 relationships) times customer importance ranking. Relative importance is based on assigning ordinal ranking to each design requirement based on absolute rank (from previous step). Numbers are then added up in their respective columns to determine the importance for each technical descriptor.(Fig.9)

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II. CONCLUSION

It is now time to think totally afresh on the process of education. Instead of the engineering education being driven by academic considerations, we need to devise a system that is driven by the customer i.e. the corporate world and the process to be treated as Quality Assurance system as being done in the industry, the academicians being the mangers who control the process. That throws a lot of challenge to the Directors and Deans of educational institutions, who need to reinvent themselves as the CEO of a corporate, and the Academicians to reinvent their role as mangers running an industry. Even the founders need to think that they are actually running an industry and not just a Trustee-type organization. All the rule of the manufacturing can now be applied to the process of engineeringt education.

QFD is a systematic means of ensuring that customer requirements are accurately translated into relevant technical descriptors throughout each stage of product development. Therefore, meeting or exceeding customer demands means more than just maintaining or improving product performance. Thus it is worthwhile to allocate resources to attempt to understand the customer.QFD provides the institute a means to understand customer needs and gives it strategic direction for continuous quality improvements. However, the voice of the customer must be carried out not only during the academic design process but also throughout the implementation process as well.

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