# Prioritization of Design Requirements for Quality Engineering Education

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## ABSTRACT

*The educational institutions must strive to impart quality education and have to create greater satisfaction in their customer group. Quality Function Deployment (QFD) which is a customer driven tool in implementing Total Quality Management (TQM) helps to accomplish this task. One of the phases in QFD methodology is known as House of Quality (HoQ), which is concerned with translating the voice of customer into design requirements by stakeholders. Design requirements will determine how the customer needs are to be fulfilled. This paper presents an integrated methodology (HoQ-ANP) to translate Voices of Customer (VoC) or customer needs (CNs) into design requirements (DRs) and to determine the importance weights of DRs by considering the complex dependency relationships between and within Customer needs and DRs for total quality in engineering education. In order to deal with the vagueness, uncertainty and diversity in dependency relationships fuzzy set theory and group decision-making technique are used to determine the priority structure of CNs, inner dependence among Customer Needs (CNs), Inner dependence among DRs and inter-relationship between CNs & DRs. Prioritization of design requirements for quality engineering education is determined through a case study by employing HoQ-ANP methodology.*

*Keywords:* *Analytic Network Process, Customer Needs, Design Requirements, Fuzzy Numbers, Quality Function Deployment*

## 1. INTRODUCTION

Engineering education is a process of developing techno human resources, which are to be used later as input to industry which in turn produces goods and services for the societal use. Liberalization, Privatization and Globalization led to increase in the number of ill - equipped engineering educational institutions in India. Therefore, there is a greater need to instill quality in engineering education to produce technically skilled and creative man-power in India.

DOI: 10.4018/ijamse.2014010102

Education is not only a rigorous study process of obtaining necessary professional qualifications, but it is also the intellectual development of an individual, which will have an enduring impact on one's life. Therefore, quality engineering education means not only adding value to students, but also to the society as a whole. Quality engineering education is the development of intellectual skills and knowledge that will equip graduates to contribute to society through productive and satisfying engineering careers as innovators, decision – makers and leaders in the global economy of the 21st century (Natarajan, 2002).

The education sector that produces the human resource has a pivotal role in the quality movement that demands total quality approach in the education system to live up to the requirements of the industry(Mariappan, 2002).

Quality Engineering Education demands a process of continuous improvement of and dramatic innovation in student, employer and societal satisfaction by systematically and collectively evaluating and refining the system, practices and culture of engineering education institutions (Natarajan, 2000).

The QFD application in higher education is classified into three broad categories, namely, teaching effectiveness, curriculum design, and instructional resources. Benjamin et. al, (1993) designed engineering education and curricula using TQM and QFD principles. Jaraiedi and Ritz (1994) applied QFD to improve advising and teaching processes at West Virginia University. Ermer (1995) showed the design requirements to satisfy each customer by considering faculty, students, and industry as clients.

Hwarng et. al, (2001) applied QFD to translate customers' voices into operations requirements at the National University of Singapore. Clayton (2003) used QFD to provide productive quality learning. The analytic network process (ANP) approach has been used in QFD in product planning to prioritize ECs in order to overcome some shortcomings of the traditional QFD models (Karsak, Sozer, & Alptekin, 2003; Partovi & Corredoira, 2002; Buyukozkan, Ertay, Kahraman, & Ruan, 2004).

Quality Function Deployment (QFD) is one of the quantitative tools and techniques of Total Quality Management that could be used to translate customer requirements and specifications into appropriate technical or service requirements (Baba et al., 2009). QFD process is initiated with capturing the voice of customer and it can be used to measure customer satisfaction (Durga Prasad et al., 2008).

QFD is a planning process that includes four matrices namely; product planning matrix, part planning matrix (part deployment matrix), process planning matrix and production planning matrix respectively, and the first of them is also referred to as House of Quality (HoQ) (Liu, 2009).

The customer portion of HoQ is established by capturing the voice of customer (customer needs) and preparing the priority ratings of the customer needs. The priority ratings reflect the preferences of the customers. A few approaches are also available for the determination of priority ratings of customer needs (Sharma et al., 2007).

The HoQ translates the customer needs obtained from the customer's perception into appropriate design requirements using the designer's perception. The HoQ maps the prioritized list of customer needs to appropriate design requirements and it also gives the priority ratings of the design requirements. Designers have an in-depth knowledge of the functions of the product, and they usually express their information in technical and clear terms (Kazemzadeh et al., 2009). Chandra Shekhar et al (2013), determined weights of the factors that enhance the quality in engineering education institutions (EEIs) using AHP.

More number of engineering educations institutions are established in private sector due to the policy of the government. Unfortunately, higher percentage of student failures in the university examinations, fewer amounts of placement opportunities is the major defects

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