

Applying QFD Tools for Quality Improvements in Curriculum Design and Teaching Strategies to Meet with the Customer (Learner) Needs

Hamada Fawzy Thabet Abuzid

Department of Business Administration, Community College,
Prince Sattam Bin Abdulaziz University, Alkharj, Saudi Arabia

Abstract: This research has used Quality Function Deployment (QFD) tool to systematically and objectively identify, assess and measure the learning needs of the students and accordingly designing and developing instructional strategies which fulfil the customer needs. The tool has been applied on a single course of business administration program students in Community College, Prince Sattam Bin Abdulaziz University. Given the requirements of QFD-house of quality matrix, the researcher has assessed the effectiveness of instructional strategies with the point of view of relevant professors, staff and the students vis-a-vis achieving the program's ultimate goals. The findings of the research fairly lead to conclude that there appears a perceptual gap between the actual learning needs of students and applicable instructional strategies in relation with the ultimate learning outcomes being expected by the university. The researcher has recommended the application of QFD tool time to time in order to reduce the gap between the actual learning needs of the students and the educational services provided by the educational institutions.

Key words: Quality functions deployment, QFD in learning, curriculum, teaching strategies, house of quality

INTRODUCTION

The multiple and rapid advancements in institutional environment are the facts due to adoption of information and communication technologies; legislation and policies; cultural, social and political change. Higher education institutional environments are not the exceptions in this pursuit rather universities are supposed to evolve as quickly as possible to survive in this complex environmental dynamism and to provide educational and training services of high quality and competitive to meet the expectations of the stakeholders (Ictenbas and Eryilmaz, 2011). It encompasses the identification and definition of the objectives of educational programs to be linked to the expectations of all stakeholder. Educational institutions has three core participants in the environment; the students, faculty and supportive staff. Students are the key elements to be transformed into a desirable contributor to the society and be reminded that the present day student is much more informed and connected to the world. So, the educational institutions should be objectively updated and be responsive in the student transformation process. Each professor undertakes a number of teaching strategies in the courses to achieving those expectations and satisfying customer

needs. This research has specifically focused on the measurement of exact student's needs in relation with the instructional strategies as well as the course designs applications by applying QFD tools.

Quality Function Deployment (QFD) during seventies of last century provided a methodology to clearly identify the key customer needs and expectation for any product they require. QFD tool helps in translating customer needs in a product design process in such a way that both customer expectation and product quality standards are met significantly (Sahney *et al.*, 2004). Practically, it stressed upon performing and acting in a right way and termed it as "Do the Right Things". Further, a product design process which entails the customer needs has less likely to fall into error. In education sector, the function helps disseminating quality by selecting "the right things to do", i.e., assessing a customer (student) needs and translate those needs into teaching strategies by following the concept of deming cycle (PDCA).

Literature review: Verna (2014) applied QFD tool on one university course (Accounting) and confirmed the importance of measuring the needs of the beneficiaries of educational services. In another research Qureshi *et al.* (2012) and Sirias (2012) sought to deploy quality

functions in an experimental learning activity and identified skills set needs from the perspective of students and concluded by suggesting most effective teaching methodology in the classroom, outside the classroom and evaluation processes. Hamza (2011) carried out a study in Kuwait labor market to assess the training requirements and priority of training components by applying QFD tool. The study focused to establish particular training programs which actually fulfilled the needs of the customers. He identified a number priorities of learning relevant to participants with the help of QFD tool. Maguad (2007) made an effort to determine the role of Quality Function Deployment (QFD) tool in higher education and found it effective for the schools management to focus on priorities. Peters *et al.* (2005) determined the methodology of using QFD in educational program design and found the tool effective in measuring the service quality and achieving the learning outcomes of educational programs. In a comprehensive study (Miley and Gonsalves, 2003) asked questions to 874 students in the undergraduate programs of three different American universities to identify the most daunting factors for the students which affected their results? It was concluded that the instructor's failure to regulate the process of teaching, talking rapidly during the explanation, lecturing presented in a low voice. Young and Shaw (1999) applied a research on a sample of 912 students of University of North Colorado to evaluate the effectiveness of teaching for courses they teach. The study found that the best faculty members developed scientific and functional value of their courses and worked for the motivation of their students and the enthusiasm of the educational process. And the faculty members who faced communication and interaction problem with the students reduced their effectiveness in teaching courses.

Research problem: In education sector, the accreditation bodies are the catalysts to pursue Arabian universities to adopt the quality of educational services all educational programs and stimulate the academic leaders and faculty members to adhere to quality standards in the faculties and scientific departments. Past studies are in abundance which stress upon the importance of measuring the needs and desires of customers (students/staff) in the educational programs and accordingly designing their courses. Most of these concluded with the identification of a perceived gap between the level of services provided by higher education institutions and the services required by the beneficiaries. The Arab universities and colleges study programs lack the consensus between the intellectual or cognitive development of the students with

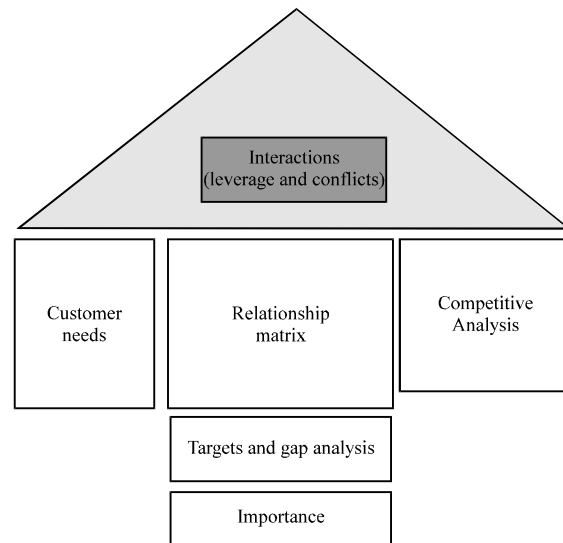


Fig. 1: House of quality

actual skills and abilities set needed in the requisite labor market skills and abilities. Therefore, this research seeks to apply house of quality matrices as the QFD tool to potentially identify customer learning needs in relation with learning objectives of the institutions as well as translating those needs to the technical specifications to be achieved through effective teaching strategies (Fig. 1).

Research goals: Using quality function deployment tools in this research helps achieving greater efficiency and effectiveness in the design and delivery of university education services corresponding to the educational needs of learners. Transforming customer expectations into an educational process helps in the following: Providing educational service according to the customer (students/staff) needs corresponds to the concept of doing things right (Doing Things Right). Improving the educational process including curriculum designs contributes to efficient operations that corresponds to the concept of doing the right things (Doing the Right Things). The application of customer satisfaction concepts to improve quality of education and training provided to the students.

The other relevant sub-goals can be derived as under: Ensuring applicability of QFD-HoQ matrices in higher education institutions to improve the quality of educational services provided by them. Constructing a practical guide on how to design courses and updating educational curriculum at the university level by using QFD-HoQ tools.

Theoretical framework

The concept of quality of service: The term quality of service is a scientific terminology and has specific perspective. The studies in the field of quality of service agree that it is the user (beneficiary of the service) who rates the degree of excellence in performance of the service. Gronroos (1984) determined that the quality of service was made up of three main dimensions, technical quality: technical aspects of the product or service, functional quality: processes of service acquisition by the customer and its interaction with the service provider and finally, the organization image as a quality dimension: the customer experience to the functional dimension of the service. Jabnoun and Khalifa (2005) emphasized upon the four dimensions of the services quality which they identified in measuring and evaluating the services quality in banking sectors. They exhibited these dimensions as personal skills, dependability, values and the corporate image and further added that measure of service quality might add or subtract dimensions as per culture of a country. Pakdil and Aydin (2007) identified the quality of service dimensions in air industry as: workers, concrete aspects, response, reliability, availability, mental picture, models and empathy. In another study (Randheer *et al.*, 2011) determined that the aspects of quality were: tangible aspects, reliability, responsiveness, safety, empathy and culture. The proponents of quality have bipolar division into relativism and objectivism and define the concepts of quality in five terms; exceptional which is the expression of all of the properties that exceed the standards and expectations of the client, consistency as the concepts of zero errors, fitness as the befitting manner to come up to the expectations of the customers, value is monetary value which is added to the level of quality provided in the product or service and transformative as a process to achieve qualitative changes in product or service designs.

The concept of quality in higher education: The evaluation of educational process of higher education institutions is not merely linked to see the degree of attainments of objectives in numbers but is to understand the achievement of the right degree of awareness of both the work and thoughts. Thus, the concept of quality here is a part of the concept of excellence in standard while the other part is to conceptually elucidating the educational service quality as the “difference between the expectations of the students about the service provided to them and the actual performance of the educational institution” and there exist a measure to evaluate the degree of excellence in the provision of educational services. Garrison and Kanuka (2004) highlighted that excellence of an educational process depended upon

meeting the learning needs of the students and developed a scale to determine the degree of excellence in the educational services in the following equation:

$$\begin{aligned} \text{Performance} &= \text{Capacity} * \text{Desire} \\ &= (\text{Knowledge} * \text{Skill}) * (\text{Attitudes} * \text{Trends}) \end{aligned}$$

Several studies also indicate the exact meaning of the quality of education and educational system in relation with the concept of total quality management process with input-process-output. Inputs in this process are: students, faculty, infrastructure and ancillary staff whereas the processes include: teaching and learning activities and the output are the distinguished and enlightened students (Sahney *et al.*, 2004). Quality contribution to university education appeared in the terms of teaching effectiveness as compared to the degree of student learning and ability of the educational process to inculcating basic skills efficiently and consistently (Shoulders and Hicks, 2008; Peelo and Wareham, 2002). Angelo and Cross (1993) emphasized upon the capability of the process to respond to customer (learners) need continuously and manifested the role of an instructor in qualitatively enhancing the outcomes of an educational process. The optimization in this pursuit begins by listening to the learner needs to attain required satisfaction and designing strategies accordingly to contribute to the professional growth of instructors.

Pearlman and Tannenbaum (2003) highlighted the high priority initiatives of Australian universities which stress upon the evaluation of teaching process, satisfaction of learners and resultant learning outcomes. The British universities introduced creativity factor in learning and teaching processes which focused on disseminating good teaching practices to collectively gain benefits and synchronizing the quality of educational service. Due to the intangible nature of the service, it is difficult to measure to see how the students are transformed into knowledgeable individual (Michael, 1998) and without such measurements, it could be difficult to make any improvements. Things that cannot be measured cannot be managed which can no longer be managed cannot be improved or sophisticated. The use of QFD-House of quality tool in an educational process as substantiated by various past studies was proved successful particularly in improving the curriculum designs, teaching strategies and meeting learner needs (Angelo and Cross, 1993; Lam and Zhao, 1998; Koksai and Egitman, 1998; Jaraiedy and Ritz, 1994; Aytac and Deniz, 2005; Tsinidou *et al.*, 2010; Hamza, 2011; Verna, 2014).

Quality Function Deployment (QFD): QFD tool was first time introduced in 1972 by the engineers “Nishimura and Takayanagi” in Japan. It was later on successively applied in various operation research studies as well as in education development studies. Jnanesh and Hebbar (2008) explained that there was no specific methodology defined for QFD but there were a set of principles described the components and characteristics of QFD. Bernal *et al.* (2009) highlight quality as a system design process to planning and translating needs of the client with the specific characteristics of quality in products, processes and services to achieve customer satisfaction. They further added that improvements in service design could affect the output tremendously. QFD has three basic steps, first; identify your customer, second; identify the needs and desires of the customer and three; transform these needs into technical specifications to meet them. QFD-House of quality tool determines relationships among the customer expectations, technical descriptions, objectives and priorities and the sub factors interrelation.

Customer needs: Hughes and Kitson (2012) in their research strived to establish a clear relationship among the various factors such as employment rate, economic growth and the resultant contribution of universities educational systems and found a significance. Similarly, Borahan and Ziarati (2002) identified in their research study a significantly positive association in the educational system of the state and quality of competitiveness of the state. In all previous researches, the critical factor in applying QFD tool is to determine the client's needs and expectations towards the service provision and the determination of the final customer. As far as the nature of the process is concerned, no finality on the part of educational institutions has been established about the educational services is it a student or an employee? whereas some past researches established the students as the final customer and real beneficiaries (Coate, 1990; Singh *et al.*, 2008). Similar ambiguous situation also existed in Arab educational institutions about the finality of customer and how students who did not have this clarity could be able to influence the decision? It is clear that the learners are the main customer for the educational institutions but they do not have the necessary capacity and skills to determine their educational needs accurately. However, the instructors possess those skills and capabilities to identify those needs in order to develop educational programs and strategies.

Instructional/teaching strategies: Once customer needs (WHATs) are identified, then comes the determination of appropriate educational strategies (HOWs). The

educational strategies are the combination of teaching methods which are used throughout the 3 h lesson per course per week to achieving the needs and requirements of the learners and there appears the need of linking the selection of appropriate strategic relationship of educational objectives associated with the teaching strategies and the customer needs.

MATERIALS AND METHODS

Research methodology and sample selection: The researcher has adopted a descriptive approach in characterization of QFD-House of quality tools to using them systematically to improve the quality of services of higher education institutions. Analytical method was used to study and analyze the views of customers (students/staff) toward their educational needs as well as the opinions of faculty and professional staff members were also obtained toward teaching strategies in order to translate those needs. A quantitative approach was applied to measure and calculate the relative importance of each teaching strategy in particular and compared via relationship matrices of House of Quality (HOQ). The research was applied to the students of first level in program of Business Administration at Community College, Prince Sattam Bin Abdulaziz University, Al-Kharj, Riyadh region, Saudi Arabia. A total of 160 students (60 from morning classes and 100 from evening classes) and 25 PhD faculty members participated in this research. The students were to give opinion about their courses, lectures, instructional strategies so as to compare these later with the course objectives, student needs and educational process.

Quality Function Deployment (QFD) methodology: The application methodology of QFD has the following steps.

Identify the needs of customers (students/staff): The real issue is the identification of final customer of educational services institution and practically there is no consensus on a final customer in higher education institutions as already discussed in previous theoretical framework. So, the researcher preferred to rely on specialist professors in business administration to determine the knowledge, skills and abilities (basic/advanced) that must be provided to the students in the business administration program. Consequently, the opinion was taking from twenty five specialist professors to determine the necessary skills and capabilities to be ensured in students of business management courses. A universally preferred list of skills and capabilities was delivered to obtain responses of importance from scale 1-10 from the faculty member, students and staff. Their weights were presented in Table 1 with reference to each perspective.

Table 1: Knowledge, skills and abilities in management course

Description	Weights: instructor's perspective	Weight: student's perspective	Weights: employee's perspective
Basic knowledge			
Concept and contents of managerial processes	7	2	7
Management science and its theories	5	3	3
Basic management functions	9	5	9
Business projects	4	2	6
Business environment	6	5	5
Advanced knowledge			
Evaluation of managerial thought	5	2	2
Discuss every functions of management	8	6	9
Projects life cycles	6	5	4
Basic skills and abilities			
Teamwork formulation	7	4	9
Scientific thinking	6	3	8
Behavioral skills	7	6	8
Advanced skills and abilities			
Creative and innovative thinking	6	3	8
Problem solving and make decision	7	4	9
Leadership skills	6	5	9

Table 2: Relationship matrix (student needs and teaching strategies)

		S1	S2	S3	S4	S5	S6	S7
Relationships	Weight	Lecture	Case study	Discussion	Role playing	Individual evolution	Problem solving	Research and projects
Basic knowledge								
Concept and contents of managerial processes	7	9	0	3	0	0	0	0
Management science and its theories	3	9	0	3	0	0	0	0
Basic management functions	9	9	0	3	0	0	3	0
Business projects	6	3	9	3	0	0	0	0
Business environment	5	9	0	3	0	0	0	1
Advanced knowledge								
Evaluation of managerial thought	2	3	0	3	0	0	0	9
Discuss every functions of management	9	9	3	1	0	0	0	0
Projects life cycles	4	1	9	1	0	0	0	3
Basic skills and abilities								
Teamworks formulation	9	0	1	9	3	0	0	9
Scientific thinking	8	1	3	9	0	1	9	3
Behavioral skills	8	0	0	3	9	3	0	0
Advanced skills and abilities								
Creative and innovative thinking	8	0	9	1	0	3	9	1
Problem solving and make decision	9	3	1	3	0	3	9	0
Leadership skills	9	0	1	3	9	0	0	0
Teaching strategies weights	-	360	240	239	180	83	225	113
Comparative importance for strategy	-	25.0	16.6	16.5	12.5	5.7	15.6	7.8

Customer needs ranking according to their importance:

This step classifies the ranking of the required each skills and knowledge in the academic program as per the students weightage. The students and faculty members were given option to rank these needs and Table 1 highlights that how much convergence exists between the importance given by students and faculty members to each skill and knowledge.

group and if there exists diversity, then linking educational strategies needs a careful review of teaching designs. The specialists professors from the college have selected the most widely used and effective strategies for teaching to provide with those skills and knowledge and the same have been used in this research such as: lecture, role playing, case study, group discussions, individual evaluation, problem solving, research and projects.

Translating customer needs into technical specifications: how's (instructional strategies): Next step comes after determination of customer (student) need to precisely link the efficient and effective educational strategies to meet up those needs of the customers. The other important aspect of linkings educational strategies is to ensure that students belong to a homogeneous class

Building a relationships matrix: This is the central part of HOQ-House of quality to establish a matrix relationships to link the teaching strategies with the student needs. This linking shows that this strategy is effective in attaining this particular skill. The scale has points from 1-9 where point (9) shows a very strong relationship (5 or 6) show a strong relationship (3)

highlights a medium relationship (1) highlights a weak relationship. Any segments shown with Zero (0) exhibits independence or no relationship of that particular strategy with the skill. Table 2 highlights these relationships.

Determining the weights of importance of each technical specification: This step determines the importance of each teaching strategy from the teacher perspective which is calculated a sunder:

$$\begin{aligned} & \{\text{Weight of importance of each element} \times \\ & \text{strong degree of each interview strategy}\} \\ & [\sum WI_{(1, 2, 3, \dots, n)} \times Rs_{(1, 2, 3, \dots, n)}] \end{aligned}$$

$$\begin{aligned} \text{Total output of lecturing strategy} &= (7 \times 9) + \\ & (3 \times 9) + (9 \times 9) + (6 \times 3) + (5 \times 9) + (2 \times 3) + (9 \times 9) + \\ & (4 \times 1) + (9 \times 0) + (8 \times 1) + (8 \times 0) + (9 \times 3) + (9 \times 0) = 360 \end{aligned}$$

$$\begin{aligned} \text{Relative importance of lecturing strategy} &= \\ 360/1440 &= 0.25 \times 100 = 25\% \end{aligned}$$

RESULTS AND DISCUSSION

The relations between the needs of the students and the appropriate instructional strategies as determined in the lights of weights of importance of HOQ-House of Quality model can be explained as follows.

First regarding basic knowledge of business management: Traditional lecturing strategy has shown a strong relationship to basic knowledge at the beginning of the business management course but its efficacy declined with the time when the course reaching to end of semester. However, each case studies and discussions strategies ranged from medium to high to meet with the needs of students. It suggests to add up such strategies as a part of teaching schedules. Other instructional strategies did not show any relationship with the student needs at this level.

Second regarding skills and abilities of the business management: Each of the problem-solving and role-playing games strategies has shown a strong relationship with the required skills for business management due to their fitness to handling the nature of most complex subjects. These strategies were able to reach the course objectives efficiency and effectiveness and results identified a variety of situations skills, addressing practical problems in an analytical way which appeared suitable to be provided to the students. The group discussions and case study strategies found a

medium relationship in this aspect to achieve the needs of students. Individual assessment and research strategy has achieved weak relationship to some extent.

Third, generally, traditional lecture strategy: Has a strong relationship to meet student needs and weighs relatively 25%, followed by case studies and discussions strategies which had relative weights from 16.6, 16.5%, respectively. Problem solving strategy came up with a relative weight of 15.6%. Role-playing strategy showed to some extent medium-relationship with the needs of students with a relative weight of 12.5%. And individual assessment and joint research strategies showed to some extent a weak relationship during the different periods and got relative weights of 5.7 and 7.8%, respectively.

CONCLUSION

In light of the results obtained by applying Quality Function Deployment (QFD) House of Quality (HOQ) tool to determine the educational and training needs of students and staff in the business management course at the university level, it is observed that QFD tool has the ability of to identify the most effective teaching strategies to meet with the educational needs of its customers (students/staff) and the objectives of the course. QFD tool assists in determining the more effective means to identify educational needs of student/staff and the ability to determine the most effective ways to achieve them. It contributes in drawing specific ratios map that shows the importance of each teaching strategy according to its relationship for the achievement of institutional teaching objectives. Further, it can also be used to integrate with the Deming Cycle (PDCA) in order to carry out the continuous improvement of the study courses from the perspective of students, staff and professors as well as other stakeholder of the educational process. QFD tool helps in devising teaching strategies that fit in classroom according to the diverse characteristics of the students in order to inculcate desired skills and abilities in the students. It allows the decision makers in educational process to identify and overcome the actual and perceived quality gap to ensure the provision of quality services as promised. Finally, QFD tool can be applied to carry out a comparative analysis among various institutions by constructing the evaluation matrix of required educational needs and how effectively these are met. A top ranked university evaluation matrix may be applied as a reference for scores assessment and it provides us with scientific evidence to determine the needs of students if applied in design of university courses. It can work as an advisor for the instructor to achieve excellence in provision of educational services.

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