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A QFD APPROACH TO INTEGRATE CUSTOMERS REQUIREMENTS IN DESIGNING AN EDUCATIONAL PROGRAM

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ABSTRACT

Based on QFD overall concept, the paper presents an approach in improving an existing educational "product": the Business Engineering Program. The overall aim of the research undertaken was to identify institutional priorities to be addressed in order to meet the customer needs and to promote excellence in teaching, learning and service for all key constituencies. The main framework for analysis was based on the "House of Quality" concept, where the emphasis was on identifying and structuring customers requirements as a major input for addressing institutional priorities with a view to improving the overall performance of the educational program.

1. INTRODUCTION

The Business Engineering education was developed in the last ten years within more than 20 universities in Romania. The learning offer varies from three year college education, to five years education and Master's programs. This paper is focused on the five years program offered as a specialization in several engineering fields as well as other fields, such as: mechanical engineering, electronical and electrotechnical engineering, machine construction engineering, chemical engineering, textile engineering, agronomy, etc.

The mission of the business engineering education is to create, by means of interdisciplinary studies (engineering, managerial and economic), professionals capable to design and manage production systems, or parts of these, as well as to generate the network of relationships which link these systems to the socio-economic environment in which they are functioning. This new educational product provides the knowledge background necessary for a thorough understanding and real "ownership" of the production systems functioning, a premise from which the graduates can accede, according also to their personal abilities, to a managerial position and status, as a supreme fulfillment of their professional competence.

The academic structure of the business engineering program offers a good balance of engineering (55%) and managerial and economic (45%) education. The theoretical knowledge is provided by means of a strong IT support, while the practical training has as a key component the students work within "The Network of Business Simulators", a structure which is a member of the European structure EUROPEN.

Within the Technical University of Iasi the Business Engineering education was established in 1992. In the following years it was developed within four out of the ten faculties of the university: textile engineering, electrical engineering, mechanical engineering and chemical engineering. Coordinated by the Department of Management and Production Systems

Engineering the program comprises nowadays over 800 students and has more than 60 academics involved in teaching activities. More than 90% of the graduates are employed in their field of specialization and many of them succeed to a managerial position.

2. THE QFD APPROACH

Developed by Japanese quality experts (Mitsubishi–Kobe, 1972; Toyota, 1977), Quality Function Deployment (QFD) refers to the philosophy and adjacent sets of planning and communication tools focusing on customer needs and wants in coordinating the design, manufacturing and marketing of products. Used worldwide as a powerful quality tool, QFD represents a meaningful means of translating client requirements into the appropriate technical requirements for each stage of product life cycle [1, 2, 3, 4, 5, 6].
Of the four planning documents, the "Customer Requirements Planning Matrix" or the "House of Quality" is the basis of QFD. This matrix relates customer requirements or attributes ("the voice of the customer") with technical features or counterpart characteristics in order to make sure that the product meets the customer needs [7].

3. CUSTOMERS REQUIREMENTS

Customers requirements were defined from the perspective of the program's clients, which for the purpose of this research were considered to be the students enrolled in the Business Engineering program. The study was based on a quantitative approach by means of a questionnaire based survey addressing the population of more than 800 students currently enrolled in the program. The sample size was 148, consisting of the students from the fourth year of study, with an 85 % rate of response. The questionnaire development was based on the current structure of the Business Engineering curricula leveraged by the KSA continuum approach of the learning process. The product requirements in customer's terms are presented in Table 1.

TABLE 1. CUSTOMER REQUIREMENTS FOR THE BUSINESS ENGINEERING PROGRAM

ATTITUDES	SKILLS	KNOWLEDGE
Professional wise	Technological skills	technologies for the pharmaceutical industry
		technologies for the perfumes industry
		technologies for the cosmetics industry
		clothing design
		technologies for the leather industry
		equipment / tool-machines design
		unconventional raw materials for the clothing industry
		unconventional raw materials for the leather industry
		Computer Aided Design for the textile industry
Professional wise (contd.)	Technological skills (contd.)	Computer Aided Design for the mechanical industry
		Technologies for production of nuclear energy
		Unconventional technologies for production of electrical energy
		numerical controlled machines
		energetic resources and policies
		electrical energy transport and distribution
		electrical measurements

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	Managerial skills	General and Strategic Management
		Performance Management
		Marketing Management
		Production Management
		Quality Management
		International Management
		Small Business Management
		Intercultural Management
		Business Administration
		Risk Management
		Human Resource Management
		Time Management
		Decision Making
		Negotiation Techniques
	Economic skills	Stock Exchanges Managerial Finance
		Managerial Accounting
		Public Finances
		EU Economic policies
		Marketing Research
	Social skills	Communication
		Sociology
		Applied Psychology
		Environmental policies
		Organizational behavior
		Mass Psychology
		Reversed Psychology
	IT skills	FoxPro
		AUTOCAD
		Excel
		PowerPoint
		Internet / Search Engines Skills
		Web design
		Solid – AGE
		Corel Draw
	Legal skills	Human Rights
		Labor Law
		Commercial Law
	Legal skills (contd.)	Business Law
		International Commercial Legislation
		EU Legislation
		Consumer Protection
	Skills related to fundamental sciences	Statistics
		Technical drawing
		Applied mathematics

TABLE 1. CUSTOMER REQUIREMENTS FOR THE BUSINESS ENGINEERING PROGRAM (CONTD.)

Learning wise	Teaching Methods	More examples / case studies
		More connections with the real world
		Interactive courses / student involvement
		AV equipment
		Handouts before the course / lecture
		Up to date information / course materials
		Facilitation of individual study
		The use of internet in the teaching – learning process
		Improvements in the structure of the course materials
	Student – professor relationship	Improved communication
		Flexibility from the professors
		A better program of office hours
		Open communication
		Building Partnerships
		"Students to be treated as future professionals"
	Student work organization (courses, labs, project work, independent activities, etc.)	Group work
		Improvements in class scheduling
		Simplified class scheduling in order to allow time for independent activities
		Greater emphasis on practical work / activities
		Smaller groups of students for labs and applications
	Student evaluation methods / approaches	Less use of oral examination
		Higher use of Quizzes
		"The student evaluation should be made based on class participation, student activity during the semester, assignments / papers during the semester, project work."
		To be taken into account student' thinking and logic
		To focus on relating the theory with practice / the real world
		Open book examination
	Bibliographic materials	Larger number of books and periodicals in management and economics (also in e – format)
		Up to date bibliographic materials
		Extensive use of IT within and for university libraries
		Development of a Virtual Library
Learning wise (contd.)	Teaching equipment / Course logistics	Modernization on lecture rooms
		More computers
		Consumables for activities in laboratories
		Upgrading of labs equipments
		Direct access to modern equipment
		Access to Internet

TABLE 1. CUSTOMER REQUIREMENTS FOR THE BUSINESS ENGINEERING PROGRAM (CONTD.)

Career wise	Career development	Job fairs, contacts with potential employers, practical work in companies
	Support programs (counseling, guidance, etc.)	Individual job counseling Professional guidance Company visits Key speakers invited

4. "BUILDING" THE HOUSE OF QUALITY – THE BASIC FRAMEWORK

Key counterpart characteristics were identified based on existing teaching/learning resources, observation and in-company interviews with key constituencies linked with the delivery of the Business Engineering program and previous experience in delivering educational programs. Also, it was performed a thorough analysis of the potential non-conformities of the educational program results / products, using the cause and effect (Ishikawa) diagram. The analysis revealed that an effective and innovative approach would be to structure the counterpart characteristics according to the main categories of causes used to perform a cause and effect analysis: machinery, manpower, methods, maintenance and "mother nature".
A relationship matrix between the customer attributes and the counterpart characteristics was developed in order to emphasize strong/weak interrelationships between any pair of counterpart characteristics and to show whether the technical characteristics are adequate in relation with customer requirements.
Furthermore, an adequate usage of the QFD method and development of the "house of quality" also involves benchmarking approaches in positioning both customers requirements and counterpart characteristics against pre-defined performance / evaluation standards. In this case, as benchmarking standards were considered the business engineering programs offered by the German universities and the "pure" engineering programs offered by the "Gh. Asachi" Technical University of Iasi, Romania. Table 2 presents the main framework of the house of quality developed.

5. CONCLUSIONS

It can be pointed out that the House of Quality created the opportunity to structure the technical characteristics of an educational program around customer needs, setting the stage for further real life developments. Based on the strengths and weaknesses underlined by the relationship matrix between the customer attributes and the counterpart characteristics, an action plan for further development and performance improvement can developed by a joint team of representatives from key stakeholders. Following, real life evaluations of the proposed changes, competing "products" and counterpart characteristics will be conducted in the view of setting specific targets and addressing performance improvement priorities [8].

6. REFERENCES

[1] Dale, B. G.: Managing Quality (3rd Ed.), Prentice Hall, Herts, 1998
[2] Gitlow, H., Oppenheim, A., Oppenheim, R.: Quality Management: Tools and Methods for Improvement (2nd Ed.), Richard D. Irwin Inc., Boston, 1995
[3] Huțu, C. A., Avasilcăi, S., Apostolou, A.: Introduction to Quality, Economica, Bucharest, 2001
[4] Oakland, J.S. Total Quality Management. The Route to Improving Performance. Butterworth-Heinemann, Oxford, 1993

[5] Vasilash, G. S.: Hearing the Voice of the Customer, Production, February, 1989
[6] Rao, A., Carr, L. P., Dambolena, I., Kopp, R. J., Martin, J., Rafii, F., Schlesinger, P. F.: Total Qulaity Management: A Cross Functional Perspective, John Wiley & Sons, New York, 1996
[7] Avasilcai, S.: Defining performance requirements in management of technological changes, in Brudaru, O. (Ed.) "Studies in Management of Technological Changes", "Sedcom Libris" Publishing House, Iasi, 2001

TABLE 2. DRAFT OUTLINE OF THE HOUSE OF QUALITY

Counterpart characteristics / **HOW?** / **WHAT?** / **Customers requirements**			*Manpower* / Human Resources	*Machines* / Teaching Equipment + Logistics	*Methods* / Pedagogy	*Maintenance* / Continuous Improvement	*Mother Nature* / The Environment (Business and Learning)	**Competitive Benchmarking** Business Engineering Program at UTI - RO	Business Engineering Program at DE univ.	Engineering Program at UTI - RO
Professional wise	Technological skills	K1								
		K…								
	Managerial skills	K…								
		K…								
	Economic skills	K…								
		K…								
	IT skills	K…								
		K…								
	Legal skills	K…								
		K…								
Learning wise	Teaching methods	K…								
		K…								
	Student – professor relationship	K…								
		K…								
	Students work organization	K…								
		K…								
	Students evaluation	K…								
		K…								
	Bibliography	K…								
		K…								
	Course logistics	K…								
		K…								
Career wise	Career development	K…								
		K…								
	Support programs	K…								
		Kn								
Competitive benchmarking										
Business Engineering Program at UTI – RO										
Business Engineering Program at DE universities										
Engineering Programs at UTI - RO										