

**THE INTERNATIONAL ACCREDITATION OF EDUCATIONAL
PROGRAMS AND ISO 9000 STANDARDS**

T.A. Mazurova*, N.P. Zagrai, V.G. Galalu*****

**Associate Professor, Ph. D., mta777@rambler.ru*

***Professor, Chief of the Training Department,*

****Associate Professor, Ph. D.,*

Taganrog State University of Radio-Engineering, Taganrog, Russia

Abstract. The analysis of a problem of the higher technical education quality management is carried out. Practical experience of improvement of a quality management process in university by means of accreditation in ABET is submitted. The usage of ABET criteria estimation of educational programs for the purpose of a complex quality parameter of educational process definition is proposed. The comparison of ABET criteria with requirements of ISO 9000 standards is carried out.

Key words: quality management, education, standards

1. INTRODUCTION

To survive in the consumer market are able only those high schools which offer full complex of educational services of high quality, and therefore have the certain prestige or "trade mark". Especially it concerns peripheral high schools, as the metropolitan high schools already have advantages connected with their site. There are various approaches to improve the quality of educational services of high school as well as to increase its prestige [1, 2]: participation in competitions on the premium on quality, passage of procedure of accreditation to the international organizations, introduction of Quality Management System (QMS) according to ISO 9000 standards requirements. There are also a number of procedures of confirmation, carried out by the various organizations – the international commissions, certification departments, etc. For the higher technical education one of the most effective means of the academic and professional recognition is the international accreditation (equivalentization) of educational programs in ABET – Accreditation Board for Engineering and Technology, Inc. in the USA [2]. At present time exists already checked up tool of production (services) quality improvement – the concept of Total Quality Management (TQM). This tool is standardized as recommendations to QMS development formulated in standards ISO 9000. Today the demands to possess the ISO 9000 certificate become obligatory for any organization, including high schools. Therefore exists the problem of usage of ABET criteria estimation of educational programs procedure and its results for improving the quality

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of education in high schools as well as for QMS development according to ISO 9000 standards recommendations to minimize the expenses of organization.

2. ABET AND ITS CRITERIA

ABET is association of 31 professional engineering societies and the organizations of the USA. ABET has agreements on a mutual recognition of educational programs with similar agencies of 58 countries, including the agreement with FEANI - the European federation of national engineering programs of 22 European countries. By the beginning of 2003 in ABET it has been accredited over 2400 programs from more than 500 universities. At the present time about ten high schools are preparing to accreditation in ABET, among them is Taganrog State University of Radio Engineering (TSURE). Criteria ABET-2000 demand from high schools the precise formulation of the goals and objectives of each educational program and the proof of that there is a precise constantly working system of estimation of achievement degrees and of the program goals and objectives updating, proceeding from mission of university and interests of customers [3]. Thus, the conceptual basis of ABET criteria basically meets the requirements to QMS formulated in ISO 9000 standards – orientation to the consumer and usage of a cycle of management

The basic criteria at accreditation in ABET are (in the reduced statement):

Cr1. Students (the characteristic of students and graduates and results of their activity).

Cr2. The educational purposes of the program (the application describing what graduates will be capable to do during the first years after the graduation of the program).

Cr3. The primary goals of the program and estimation of the level of their performance (the application describing knowledge and skills of students from the obligatory list at the moment of end of the program).

Cr4. Vocational training (the detailed analysis of structure of the curriculum with definition of a ratio between volumes of natural-science, special and general training of graduates of the program).

Cr5. Teaching stuff (proofs of necessary competence and amount for maintenance at an adequate level of all kinds of works with students).

Cr6. Material resources (adequacy to the purposes of the program).

Cr7. Support of the high school and financial resources (adequacy for the guarantee of quality and continuity of realization of the engineering program).

Cr8. Special requirements to the program (if those are available).

With the help of the described eight criteria the quality of high school educational program which to be accredited is actually estimated. Thus the quality of the documentary procedures, supporting the program, as well as the quality of the training process is determined. Procedure of accreditation in ABET is standard procedure of an estimation of conformity. At the first stage the high school carries out a self-estimation on conformity to requirements suggested in criteria. For this purpose in TSURE the technique of a self-estimation has been developed. Then primary audit by external auditors was carried out. By results of audit the report which becomes a basis of development of adjusting actions is made. After performance of these actions final audit is carried out by results of which the final decision on recognition of educational program equivalent to the international requirements (or about non-recognition).

3. MAIN PROBLEMS REVEALED BY ABET ACCREDITATION PROCEDURE

The analysis of ABET criteria has shown, that those ones which determine the contents of curricula are rather close to the Russian educational standards' requirements and are easily enough to be carried out. The criteria concerning the organization of educational process also do not clash with Russian requirements. "Inconvenient" for realization were the first three criteria demanding from high schools significant efforts for definition and formulation of the goals and objectives of the program. These criteria also demand the development of techniques for these goals and objectives updating according to requirements of consumers of programs, as well as the techniques of the pedagogical work results, measurement of students' knowledge and updating of curricula estimation. Despite of these facts TSURE passed through the process of preparation for primary audit without serious consequences. Nevertheless, during the preparation and carrying out the procedure of a self-estimation the university faced the following problems.

1. "Resistance to changes". All levels of university have been involved in process of a self-estimation carrying out. This procedure has required additional requirements, both to teachers and to the contents of their work. Therefore the situation of "resistance to changes" was formed. The university is the collective of creative persons with high level of self-estimation - scientists with degrees, whose labor is underpaid in conditions of Russia. Therefore they meet additional requirements to themselves and additional work with a strong reluctance.

2. An absence of the uniform system of requirements to the university curricula. Documentary procedures of the coordination of separate disciplines were practically carried out on a minimum level. Each faculty tried to realize the corporate interests, there were no connection between separate divisions and mutual understanding between them.

3. Frequently the out-of-date curricula, which were not corresponding to the international requirements, despite of available procedure of their actualization.

4. Absence of uniform system of a complex estimation of teaching personal and students.

5. Low motivation of teaching personal for qualitative labor in conditions of low wages.

Thus, some of requirements of the Deming quality management program were not fulfilled [4]. It is obvious, that the majority of high schools are facing with similar problems during the carrying out of a quality management improvement work.

4. ABET ACCREDITATION – AS A MEAN TO IMPROVE THE QUALITY OF TECHNICAL EDUCATION

Let's consider the ways of solution the above listed problems by the way of ABET accreditation procedure.

1. Overcoming of "resistance to changes" has been carried out by a rule of organizational changes – a rule of "narrow gates", when developed in details methodical materials with the requirement of their obligatory application have been offered to teaching personal. That has allowed minimizing a variation in materials prepared by teachers. Thus, the psychological barrier has been partly broken and teaching personal was prepared for regular

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work on improvement of educational process quality. And it is the important step on a way of creation of an atmosphere of quality in the university.

2. Seven basic directions of baccalaureate preparation in TSURE have been analyzed: Automation and Control, Telecommunications, Electronics and Microelectronics, Designing and Technology of Electronic Devices, Instrument Making, Metrology, Standardization and Certification, the Radio Engineering. In result the generalized curriculum on educational program of "Electrical engineer" which contains the general disciplines for all specified specializations has been developed.

3. All programs of the readable by faculty disciplines have been updated. The requirements to their development were unified with international demands.

4. The technique of a quantitative estimation of teachers' labor quality included in complex system of teacher's certification has been developed. As the result the wages of the best teachers can be increased in 1,5 - 2 times. For students the system of their progress estimation represents the standard rating system widely used in the world. The best students receive the increased scholarships.

5. The mechanism of material stimulation specified in item 4 should become the significant factor of motivation. However its approbation has revealed a number of lacks which should be corrected.

5. A COMPLEX ESTIMATION OF QUALITY – AS CONFORMITY TO ABET CRITERIA

At any enterprise quantitative estimations of production (service) quality at various stages of their life cycle should be used. It is offered to use ABET criteria which cover all inputs and outputs of the processes included in complex educational macro process, for the estimation of educational service quality. Thus, numerical value of quality parameters according to each of criteria, corresponds to absolute or relative quality parameters under condition of base values presence. As the base values of parameters the numerical values of corresponding criteria for the high schools have been passed accreditation may be accepted. The complex parameter of quality can be calculated by one of the standard methods [4]. There are a number of methods for visual representations of quality parameters of a various sort as multivector pictures [4, 5]. From our point of view it is best to use this approach and to represent a complex parameter as the area of the figure (fig. 1).

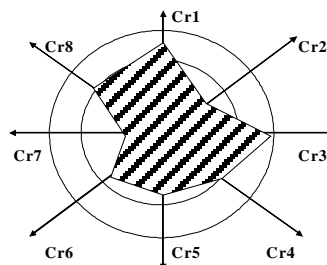


Fig 1. An estimation of educational program quality by means of ABET criteria.

Each of axes corresponds to one of ABET criteria, and circles signs minimal and maximal requirements of various standards. Advantage of such way of representation is an opportunity of a simultaneous visual comparative estimation of all parameters. For reception of

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quantitative estimations on each of criteria it is possible to use various methods. Let's consider a technique developed and practically introduced in TSURE for carrying out of estimations by three first criteria Cr1, Cr2 and Cr3, caused the greatest difficulties at a self-estimation. The interrogation of three groups of respondents has been carried out: students of a final year, graduates and employers. We shall consider the results of the given interrogation received at questioning of students and graduates of Radio Engineering faculty. The students' opinion poll was carried out in form of surveying. A unified questionnaire for TSURE students and graduates was elaborated, which includes 16 questions, connected with the objectives of the academic program Electrical Engineering. The results were evaluated according to the 5-grade scale. Students and graduates of the Radio Engineering faculty took part in the poll. The given selection is representative, as it makes up 37% of general students' number and 40% of universal set of graduates. The obtained empirical data was summarized and is represented in the Table 1, which contained the evaluation indexes calculated as ordinary (I1 – students, I2 – graduates). The 4th column contains the numbers of ABET criterions.

Table 1

<i>Question</i>	I1	I2	ACr
1. How deep is your knowledge of the fundamentals of automation and control (telecommunication)?	18	39	1
2. Do you know fundamental scientific principles underlying electronics and microelectronics?	48	41	1
3. Do you know scientific fundamentals of design and technology of radio engineering and electronic equipment engineering?	27	27	1
4. How competent are you in metrology, standardization and certification?	45	52	3
5. Have competent are you in the fundamentals of radio engineering?	59	63	1
6. Are you able to formulate, analyze and solve design problems?	55	41	1
7. Are you able to carry out experiments, analyze and interpret data in applied areas?	58	66	2
8. Are you able to work in teams performing different types of complex design projects in applied areas?	42	36	2
9. Are you able to solve complex design problems in applied areas, taking into account various practical limitations (economic, social and technological and other factors)?	18	19	2
10. Do you have ability for self-studying using literature, Internet and other sources)?	76	81	3
13. Does your education enable you to express yourself in both personal and social spheres?	53	55	3
14. Does your education provide your career promotion and professional development?	52	5	3
15. Does the level of your education make it possible for you to implement your creative potential?	41	17	3

6.FROM ABET REQUIREMENTS TO ISO 9000STANDARDS RECOMMENDATIONS

A conceptual basis formulated in ISO 9000 standards approach are the following: orientation to the consumer; a concrete definition of a role of a management; involving of all personal in maintenance of quality; the process approach to management; a system approach to management; maintenance of constant improvement of quality, etc. In the considered above ABET criteria exist the majority of these recommendations. The comparative analysis of the detailed description of these criteria and recommendations for quality system development formulated in standard GOST R ISO 9001:2001 (Russian version of standard) has allowed determining enough of this conformity. In table 2 the conformity of GOST R ISO 9001:2000items to ABET criteria is represented.

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Table 2

Abet Criterion	Items GOST R ISO 9001:2001
Criterion 1	5.4.1, 7.2.1, 7.4, 8.2.1, 8.2.3, 8.4
Criterion 2	7.2.2, 8.2.1, 8.2.3
Criterion 3	7.2.3, 7.2.4, 7.3.2, 8.2.1, 8.2.3, 8.4, 8.5
Criterion 4	8.1
Criterion 5	6.2
Criterion 6	6.3, 6.4
Criterion 7	6.1, 7.1 (B)

Thus, at the further completion of university QMS according to ISO 9000 requirements it is expediently to base on procedures of accreditation already received at ABET passage results. It will allow to reduce time and labor input of process of preparation for certification according to ISO quality standards requirements and to decrease the charges of the university.

7. CONCLUSION

In paper the problem of the coordination of quality improvement methods with methods of certification within the framework of modern market requirements for high schools is put. The basic criteria of ABET accreditation are observed. Process of accreditation is considered as one of the ways to improve the quality of educational services. The way of a complex estimation of full educational process quality on the basis of ABET criteria is offered. The results of a self-estimation of Engineering Educational Program at Radio Engineering faculty of TSURE are represented and analyzed. Comparison of ABET criteria with recommendations of GOST R ISO 9001:2001 standard is carried out. Conclusions about expediency of usage the received approach for the development and caring out the university QMS according to ISO 9000 standards requirements are made.

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