Technology of the Designing of a Quality Assurance System of Higher Education on the Basis of the EFQM Model

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***Abstract*—** The article covers the essence of the "quality" category; flowcharts of the system design process are developed for the design of the quality assurance system of higher education based on the EFQM model; an interdisciplinary approach is adopted as the methodological framework, in particular there are used the principles of the design of technical systems, some information from the logic, as well as some philosophy and pedagogy concepts; it shows that the design technology consists of three stages, with the characteristic of each stage given; developed a block diagram of technological process of designing the system of quality assurance of higher education based on the EFQM model; the idea of cooperation of designers and project users is realized.

***Keywords*—** the EFQM model, flowcharts, an interdisciplinary approach, the technology of the designing, the quality assurance system.

I. Introduction

IN Europe they often use the term "*quality assurance*," which can be understood as "*confidence in quality*." In the Kazakh pedagogical literature "the guarantee of quality" is mentioned. Currently there is a problem of lack of clarity connected with the term "quality assurance," as well as the application of the concepts in different contexts, i.e. there is no unambiguous and clear answer to the question what the quality of education is. The analysis of numerous sources on the problem shows that this is the case for all the attempts to answer the question. Researchers mention mainly obstacles in the field of education quality assurance. For example, M.Mazilu writes: "In my opinion, unfortunately, for all quality assurance stakeholders, we cannot say that this is done easily or overnight, but only by sacrifice in passing obstacles, barriers in **quality assurance in education**:

- *Absence* / lack of *knowledge / skills inquality management* in people involved in quality assurance in education
- *Techniques and quality management tools* are often considered to be an end in themselves
- *Concept*: "Quality is obtained by detecting problems / noncompliance and correcting /solving them" (including "corrective actions") and not by *preventing* their emergence (including "preventive actions").
- *Absence / lack* / inadequacy of *objectives*(with indicators and target values), *policies,strategies in quality* on the short, medium and long term
- *Excessive confidence in the quality system documents* (including *quality system certification*) at the expense of management decisions and regulated actions aimed at assuring quality. … Quality values in education: democracy, humanism, equality, and intellectual and moral autonomy, interpersonal relations quality, communication, community enrichment, and optimal social and professional insertion, education of the individual as critical and responsible member of the group." [9]

In our opinion, this is connected with the fact that quality is a philosophical category and therefore cannot be identified through other concepts. In this regard, we think it expedient not to take any definitions as a basis of this research or attempt to give our own definition, but consider the quality of education in general, as a concept. Indeed, in the UNESCO program document, quality is defined as "a multilateral concept, covering all the basic functions and types of activity in relation to higher education" [9].

In the previous works we have shown that quality assurance systems are the integrity objects with clear objectives (increasing the effectiveness and efficiency of the activity of an educational institution as well as the development level of the participants of educational activity) and functional set of components, so they can be regarded as educational systems. The result of the completed pedagogical research on the creation of the system is the appropriate project, so we raise the problem of instructional design. The controversy surrounding the possibility of designing complex systems in social sphere still exists. This is due to the fundamental problem of the completeness of each constructed model. No model, even very complex one, cannot either give a complete representation of the subject under research or accurately predict its development, or describe the pattern of its movement in its own space. Scientists when designing the systems have to balance on the border of their completeness and validity. The increase in the importance of

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interdisciplinary research in education together with the enhance of integrative function of pedagogical science, marked by V.Kraevski [8] are associated with the use of knowledge derived from other scientific disciplines and appear as one of the methodological conditions of modeling and design in educational sphere. Any judgments on such a complex issue must be based on deep analysis [2].

Considering the foregoing thesis, we have the task of designing the system of quality assurance for higher education based on the EFQM model and the interdisciplinary approach. We will use the principles of design of technical systems, some information from the logic, and some philosophical and pedagogical concepts.

II. TECHNICAL SYSTEMS DESIGN PHILOSOPHY

Design is a process that initiates the changes in the artificial environment, so technical systems can be described as the activity on creation (design, planning, and construction) of any system, object or model. Therefore, the main principle of design of technical systems is the use of scientific concepts, technical information and imagination to identify the mechanical structure of the machine or system intended to fulfill the pre-defined functions with the greatest efficiency and effectiveness. On this basis it is generally accepted that design is something what architects, engineers, artists of applied art, etc. make when creating drawings for their clients and for the purposes of production [2].

The American Heritage Dictionary defines design as: "To conceive or fashion in the mind; invent," and "To formulate a plan", and defines engineering as: "The application of scientific and mathematical principles to practical ends such as the design, manufacture, and operation of efficient and economical structures, machines, processes, and systems."[1].

In general engineers put into practice 8 stages of design and construction ([12]):

1. Initial Contact
2. Preliminary Works Stage
3. Contract Stage
4. Approvals Stage
5. Selections Stage
6. Construction Stage
7. Completion and Handover Stage
8. Maintenance Stage.

Thus, the design is aimed at creating of models of planned (prospective) processes and phenomena, in contrast to modeling, which can be extended to the past experience with a view to its deeper reflection. The components of the project activity can be represented by particular models or modules (functional units that combine a set of elements). Human project activity is determined by one's ability to build something in one's mind, invent the ideal models, only partially reflecting the real situation. J. Šedivý mentions that "Modeling is a method that is often used in professional and scientific practice in many fields of human activity. The main goal of modeling is not only describing the content, structure and behavior of the real system representing a part of the reality but also describing the processes. The process can be understood as series of transformations that changes the input values to output values. From the system point of view the process is dynamic system in which the values of the characteristic of the system elements are changed under the influence of the external elements. The models are always only approaching of the reality, because the real systems are usually more complex than the models are." [11]

III. INTERDISCIPLINARY APPROACH TO THE DESIGNING THE SYSTEM OF QUALITY ASSURANCE OF HIGHER EDUCATION ON THE BASIS OF THE EFQM MODEL

Literature on design and its methods began to appear in the industrialized countries in the 50-60-ies of the XIX century [2]. Since then, along with the traditional methods a lot of new, particularly in the social sphere have appeared [6].

Austrian scientist Kurt Gedel has proved two famous theorems of incompleteness and consistency of formal systems. Based on this it can be concluded that the uncertainty will be greater when designing social systems, including educational ones. E.N.Gusinsky has formulated the principle of the uncertainty for the academic systems, according to which the results of interaction and development of the academic systems cannot be predicted in detail [7]. Therefore, for such systems they apply the probabilistic design.

The instructional design is an activity of subject or subjects of education, aimed at the construction of models for transformation of the pedagogical reality. The essence of the instructional design consists in the identification and analysis of pedagogical problems and causes of their origin, building axiological bases and strategies of design, identification of objectives and tasks, search of methods and means to implement the educational project.

The essence of the design of an educational system is that it is the **process** of adjustment of the system characteristics for achieving or improving their effectiveness, adaptation and efficiency, so the subject of design of the quality assurance system of higher education is changing of the status of the object of the design through implementation of ideas to assure the quality of education. According to A. C. Boyarintseva, the subject of the design is the form of existence of the relationship of subject and object of design [3]. In this case, the object of design is the educational system, created for solving specific didactic tasks in a specific sphere, i.e. in the sphere of organization and management of the educational system. In this connection, the **objective of design** is to develop a new system based on the EFQM model, and **the result** will be a set of regulatory, technological, organizational documentation that is necessary to assure the system serviceability.

Implementation of the design process requires the development of appropriate technology. As is known, the **designing technology** is a sequence of activities allowing to technically perform the design of the specified object; contains a number of essential components, which are listed in the model scheme of the design process.

Thus, there is a need for detailed description of the activities on designing the system, a clear definition of design stages, and the identification of the design task. Classical is J.C.Jones's view that the design process in its development goes through three stages [5]. Based on this provision, as well as on the results of our own studies on development of theoretical and methodological basis of the design of the system of quality assurance for higher education on the basis of the EFQM model, we believe that the design of the system should be implemented in 3 stages:

1. **preliminary preparation**: **identifying the objective and the expected results, development** of methodological and theoretical aspects of the design;

2.**development the design technology** as the sequence of activities intended for achieving the **anticipated results** of the design;

3. **approbation of design technology** and evaluation of the project efficiency.

Similarly to the design stages, the design technology is also divided into 3 stages:

1) **Preliminary preparation**, which is an implementation of the practical part in the developed models (models of subsystem of quality management, model of subsystem of internal quality assurance, model of subsystem of quality confirmation). After identifying the functions of educational activity in accordance with the criteria of the EFQM model you will need the decomposition, which is the process of dividing the overall objective of the designed system into separate sub- objectives in accordance with the selected model. Functions of the project activity are complex and multifaceted, and decomposition will allow dismembering all the work on realization of the models into a set of detailed jobs that allows solving the problems of their rational organization, monitoring, control, etc. After justification input and output parameters of the model, you need to aggregate them, i.e. to connect the "inputs" and "outputs", adjusting them to each other. For transition to the next stage of the process the study of the conditions is not unimportant.

2) **Technical design** represents work on the basis of analytical reports on the implementation of the first stage in accordance with the "functioning" parameter of the developed models, taking into account the fact that the specified parameter in the models corresponds to the matrix of RADAR (Results, Approach, Deployment, Assessment, Review) indicators of the EFQM model.

3) **Full-scale development**, consisting in the development of operating documentation: regulations, plans, schemes, calculations, innovative educational technologies, methodologies, etc.

Each preceding stage is aimed to achieve its specific objectives so that to provide us with the real opportunity to move to solving the tasks of the next work phase. Each following stage is deepening and enhancing the results of the preceding stage. The final results of work are mostly determined by the mutual influence of the results achieved at separate phases of work.

Having considered the above stages one can see that we have transferred design patterns of technical systems to the design of social systems. Indeed, the terms "technical design", "full-scale development" are typical for technical systems. We believe that design should be based on scientific methods, well-proven not only in the related spheres, but also in those where it is impossible at first sight to find an analogy, conventional schemes, or developed methods. At the same time, we believe that the design of such a complex system, which our object is, shall be the responsibility of the experts, familiar with the methodology of the design of educational systems, having experience, or at least scientific intuition. We agree with the opinion of A. V. Boyarintseva that the design process shall be proceeding in specially organized designing activities aimed at the working out of the project of the development of the institution. Indeed, the design activities is carried out directly by professional engineers or by teaching staff either alone or in cooperation and under the guidance of the experts in the field of development of educational systems. This author's idea is well compatible with the idea of interdisciplinary approach, since the engineers get specific instruction and training in technical universities. Therefore, in our opinion, the system design should be performed by the engineers that are professional scientists who have mastered the design of educational systems and, if possible, by the representatives of educational institutions, directly implementing the educational-scientific-training process or managing the activities of the institution. The idea of such joint working is supported by G.Contento: "The co-design participation of 'end-user at different stages of the process is a "linear" classic research and development - ranging from concept to design, from prototyping to validation and verification, until the final engineering process. These pathways appear to co-design useful and are therefore recommended at an early stage, in order to obtain immediate benefits in terms of selection and elimination of alternatives more or less relevant…. The end user has to fully participate to the co-design phase in order to obtain better results in the validation and verification phase by putting the prototype for a sufficient long time in the same "real life" condition in which the prototype will be used, once launched in the market. This allows to evaluate the user feedback, in a development phase where the modification of the product is still feasible and economic and can avoid market failures… This process of co-design are useful and are then recommended since the initial phases, to the end of gaining immediate advantages in terms of selection and elimination of the more or less relevant alternatives." [4]

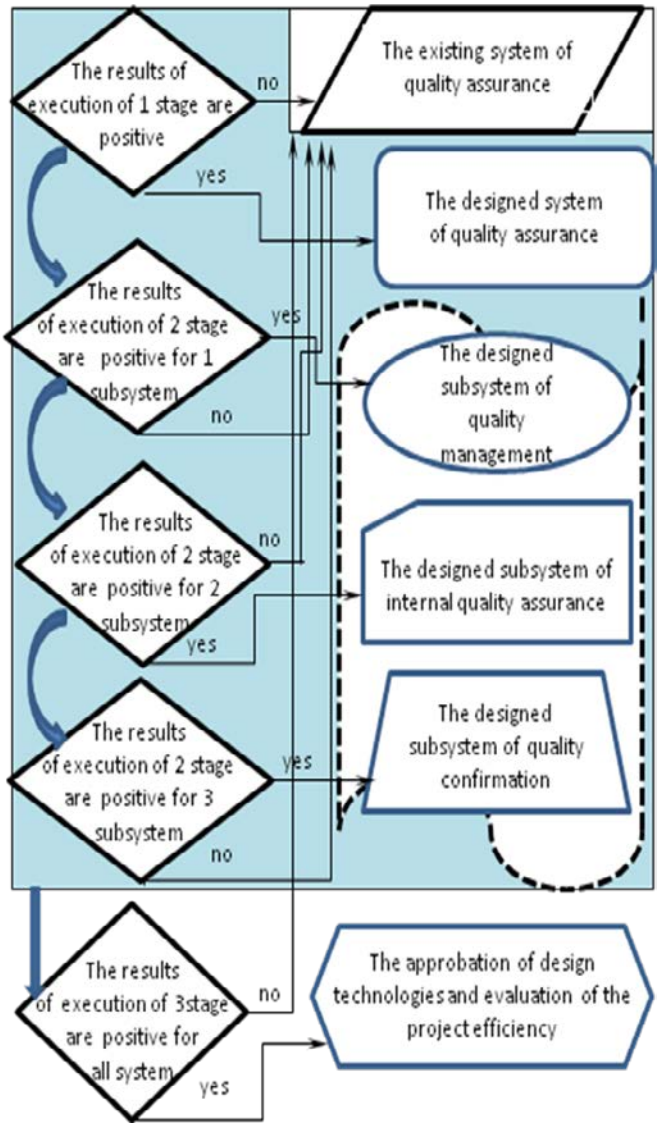

Fig.1 Block scheme of technological process of designing of the quality assurance system of higher education on the basis of the EFQM model

To organize of activity of professional engineers, the staff and stakeholders, we have developed a block scheme of the technological process considered (figure 1).

The scheme displays the attempt to re-apply the patterns of mechanical systems design to the design of a social system. Indeed, in the left part of the scheme, the sequence of design stages is shown, with each block having two outputs: "yes" and "no." Then, depending on the response there is an alternative for further steps. In the right part there are blocks, representing the existing system and the planned one, and besides the latter lists all three subsystems. Blocks related to the newly designed system, are enclosed in a polygon, bounded with thin lines and slightly colored. The transition from the left blocks to the right ones enables the serial design of subsystems, which ultimately will result in the project of the entire system, or, in the case of output "no" will return to the existing system. In case of positive results you can move on to the next phase of the design process that is to the approbation of the technology and evaluation of the design effectiveness.

The block scheme developed is used as the foundation of technological process implementation chart for each subsystem. As an example is presented flowcharts of the design process of quality management subsystem of quality assurance system of higher education on the basis of the EFQM model in table I. The stages of design, which are proved by us above, are listed in the first column of the chart, the following are tasks for each stage, the kind of activity of the subjects of design activity, modeled by trained designers task output. The similar charts are developed for other subsystems too.

Table I

Flowcharts of the design process of quality management subsystem of quality assurance system of higher education on the basis of the EFQM model

Design stages	tasks for stage	the kind of activity of the subjects of design activity			task output (modeled by designers)
		Leaders of the organization	the Staff of the organization	Stakeholders	
Preliminary preparation	Decomposition.	Connection with employers		Development of the occupational standards	Analytical note about the status of input and output model parameters, the information about the demand and the level of graduates' employment
		Requirements determination for activity quality		Requirements formulation for the level of the graduate's education as degrees of	

				achievement of education results	
		Determination of mark demand for specialists		Participation in the determination of market demand for specialists	
		Contract analysis		Participation in the contract analysis	
	Aggregation	Formation of the understanding of the necessity of expanding connection with employers	Study of the occupational standards or requirements for the level of the graduate's education as degrees of achievement of education results		Development of implementation considerations for quality requirements within marketing, competence-based approach in condition of result-oriented education
	Study of the conditions	Revelation of the personnel motivation level for improvement of the education quality	Participation in revelation of the personnel motivation level for improvement of the education quality		Development of considerations for forming the high motivation of the staff to improve the education quality
		High requirements analysis of the activity quality			
Technical design	Implementation of the function "Approach"	Targeting the consumer of the University activity	Consumers adaptation in its activity		Development of considerations on improving the performance of interaction of the design activity subjects
		Assistance in improving the performance of interaction with consumers and other stakeholders		Assistance in improving the performance of interaction with the leaders and staff	
	Implementation of the function "Deployment"	Monitoring of customer satisfaction			Monitoring of consumer satisfaction and competitive intelligence в
		Competitive intelligence			
	Implementation of the function "Assessment"			Establishing of assessment criteria, participation in measuring and comparison	Analysis of measuring results, analytical report preparation

				with the previous assessment and competitors	
	Implementation of the function "Review"	Monitoring of compliance of the assessments to established criteria		Participation in monitoring compliance of the assessments to established criteria	Analysis of monitoring results, recommendations for problem isolation
		Identification of problems and response to the identified problems		Identification of problems	
Full-scale development	development of operating documentation				Development of working documentation. Development of the regulations, plans, measures, schemes, calculations, technologies, methodical instructions, etc.

IV. Conclusion

The interdisciplinary approach to the design of the quality assurance system of higher education on the basis of the EFQM model has enabled all-round analysis of the issue and practical implementation of the objective.

The proposed construction of the block scheme of the technological process of designing the system promotes the principles of design of technical systems, the laws of logic, philosophical and pedagogical concepts.

Future research will be focused on determining the effectiveness of the design of the quality assurance system of higher education on the basis of the EFQM model from the views of the interdisciplinary approach.

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