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APPROACH TO ORGANISATION OF THE HIGHER TECHNICAL EDUCATION SYSTEM

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Abstract. One of the approaches to the organisation of the system of higher technical education is considered in the article. The authors substantiate the need to create Production (technologies) Research Educational Complex. Educational Complex is a complex organisational structure and is designed for multi-level personnel training in various areas. Each component of educational complex has a purpose of functioning, organisational structure, requirements to informational, methodical, personnel and logistics support.

Key words: the Bologna process; educational system; educational systems structures; educational complex; multilevel personnel training; organisational structure; unified information environment.

Features of world development make strong impact on the national educational systems of the world countries. The modern economic environment generates many requirements to be met by the national education systems. To implement these requirements many national education systems are undergoing period of important transformations. To improve the quality of higher education it should have an international dimension. It will allow carrying out information interchange, highly qualified specialists and integration of perspective scientific researches.

National systems of higher education cannot develop outside of global processes and trends, outside of demands of the world's labour market. It is already impossible to proceed only from the national-level criteria at the decision of questions the development and improvement of higher education of individual countries. The higher school can respond to the global challenges of the XXI century only with international agreed joint actions [1]. The Bologna process is the process of internationalization in higher education (creation of the European Higher Education Area). He was primarily a response to globalisation – European response. But Bologna process itself acquires a global character [2].

Reforming of the education system continues for more than fifteen years. It is accompanied by low efficiency of resources use, discrepancy the structure of labour market needs and the higher professional education system as well as the weak integration of scientific activity into the educational [3]. All this is a consequence of weak use of system approach methodology to this process.

FEATURES OF THE BOLOGNA PROCESS REALISATION

Required parameters of the Bologna process are [4]:

- Three-level system of higher education.
- Academic credits ECTS.
- Academic mobility of students, lecturers and administrative staff of universities.
- The European Diploma Supplement.
- Quality control of higher education.
- Creation of a single European Research Area.

There are significant differences in the structure and content of training programs for graduates in leading Russian and European universities. Moreover, logistical base at many universities in Russia is underdeveloped. The outdated methods of teaching often are used in Russian universities. It also affects the possibility of competition with Western universities.

Reforms in the educational system connected with the entry of Russia into the Bologna agreement required the development of a new generation of educational standards. They are characterised by the reduction of specialties and existence problems of resource, methodological, regulatory, and staffing support of the reforms implementation process [5]. New challenges have arisen due to changes in requirements for the composition and structure of

the basic educational program and work programs of academic disciplines/modules. These requirements are expressed in the fact that the basis of educational programs is the competence approach and focus on the educational result.

Issues of comparability of higher education programs with foreign are unresolved despite ongoing reforms. It is connected by that the main parameters to ensure comparability of programs is still not fully implemented in Russia:

- Orientation on the learning outcomes.
- The modular structure of programs.
- The quality assurance system.
- A system of credit transfer.

The main directions of development of the common European space of higher education are: the formation of comparable and comparable degrees and qualifications, education quality assurance, support for students with different social status, forming the system of a comparison of learning outcomes and graduates' employability; implementation of the principle of lifelong learning and mobility. Academic mobility of all participants in the educational process is one of the essential conditions for improving the competitiveness and attractiveness of education and different from the traditional foreign or domestic internships that trainees are sent on a limited but long period of time – a semester or a year and they get full education (disciplines are counted on their return to base high school).

ANALYSIS OF THE EDUCATIONAL SYSTEMS STRUCTURES

Large universities dominate in education in the world market. They represent the university complexes including not only the educational and research divisions as well as the structures providing innovation activity of universities and their close cooperation with the industry – joint research centres of universities and industry, the science and technology parks, innovation and technology centres, the industrial research consortia, technology transfer centres and commercialisation of intellectual property, etc.

The positive results functioning of universities as innovative university complexes are available in the U. S., Western Europe, Japan and many other countries. Obvious leaders are research universities of the U. S. but there are universities also in other countries that are the serious research structures. They are different from the American system [6]:

- By the number – there is a negligible quantity of research institutions in Europe because European countries simply are not investing such a large investment in its university system such as the United States. Also one of the European system problems is the problem of the adequacy of training students to work as the same technical specialists in the private sector production since theoretically they are more prepared.
- There is a problem of replenishment – the proportion of young people in the structure of U.S. higher education above in comparison with the rest of the world.
- Assignment of degrees – the number of degrees in the natural sciences and engineering fields became significantly lower in the U.S. than in other countries especially from the moment when Europe began to transfer main emphases on the creation of a mass higher education system in order to produce the most technically trained workforce.
- The decentralisation – the government support for basic research more fragmentary and decentralised in the U.S. Universities are supported privately. Elsewhere in the world almost all universities are public and most significantly all university budgets are formed by government appropriations.
- National laboratories – the most part of budget of national laboratories organised privately is given for research work done by universities in the U.S. There is a tendency of work in individual research institutes which are separate from the learning process in other countries. Therefore there is a division of the research and training processes.

Such experience is applicable in Russia. The experience of innovation activity Russian universities confirms their ability to adapt to market demands and produce innovative products that are in demand using the results of this production to improve its educational and scientific work [7]. The process of educational research and innovation university complexes formation takes place currently in the regions of Russia. Such complexes are designed to ensure the integration of universities with real sector of the economy to address socio-economic problems in the regions.

As mentioned earlier, the main features of the present stage of development of the society are: the formation of innovative economy and intensification of the knowledge role in achieving sustainable competitive advantages, i. e. the transition to the innovation development path of economy and society based on knowledge. A special role in the development of innovative economy belongs to the higher technical school. It should ensure the formation and advanced development of scientific and technological potential of society through training professionals in engineering and scientific fields.

They will be able in the future create the technological basis for the development of our country.

The most important problem of modern Technical High School is to develop the integration of engineering and technical education with science and industry.

FORM OF THE HIGHER TECHNICAL EDUCATION'S ORGANISATION IN RUSSIA

The modern requirements for educational systems require the creation of new organisational structures conforming to the economic development tempo, education, technologies, and society in general. This results in the structural and functional evolution of educational systems. One of possible variants realisation of a new organisational structure in the educational system is the establishment of Production (technologies) Research Educational Complex (PREC). It should have a complex organisational structure and comprise: General Educational University, Scientific Research University and Research and Production University.

Each component of PREC has its own organisational structure and provides personnel training at different levels (Fig. 1). PREC activities should be organised for the implementation of quality and effective training of qualified personnel with the extensive use of the latest achievements in science, engineering and technology.

General Educational University will prepare bachelors in different directions based on a powerful material and technical base (laboratories with extensive use of information technology and information systems) with a practical, laboratory and execution of course design in large enterprises including innovative technology. To educate on the next level of training necessary continue education in the Research and Production University or the Scientific Research University. In this case, the teaching staff should be focused on educational activities: transmission of knowledge, elaboration of teaching materials and an explanation of academic disciplines as a ready knowledge can be applied effectively in practice. It is assumed that students will get a large amount of applied knowledge and skills for their future profession.

Scientific Research University will present an integration of the university and specialised research groups based on its leading scientific schools. Training of highly qualified scientific personnel will be carried out within the Scientific Research University. Scientific personnel should be able to put forward creative ideas, create unique instruments and compete in the international market of high technology products.

Educational programs in areas of training masters and doctors will be implemented within the framework of scientific schools (i. e., training of graduates will be carried out through a system of scientific schools). Scientific Research University will specialise in the development and transfer of innovative technologies.

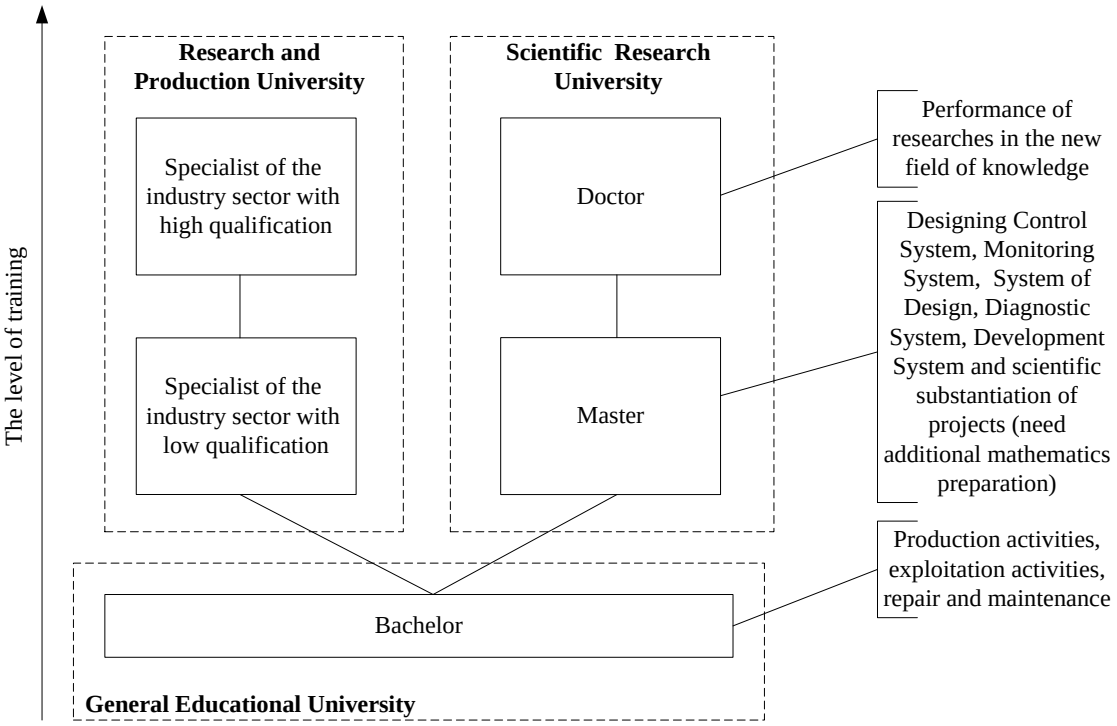

Fig. 1. Components of the Production (technologies) Research Educational Complex

In this case, the teaching staff should be focused on research activities (working in research group and as a lecturer using the laboratory bases on the Scientific Research University): own research, scientific prestige, participation in international projects, conferences, symposia, publication in domestic and foreign central publications, etc. It is planned to invite scientists for development new directions. It is assumed that the created educational environment will stimulate students to independent researches in the framework of the chosen direction.

Research and Production University will present an integration of technical education and production. It will prepare of bachelors, specialists and engineers with different qualifications in specific subject areas (depending on the needs of regional, neighbouring regions) and is organised on the logistical base of the largest engineering and other industrial enterprises. Training should be carried out directly on the production systems of the enterprise: modern informational, software and technical maintenance of automated systems, the modern software and technical complexes of enterprise control, production, complex equipment, etc. Research and Production University prepares professionals for their own business needs and also for other businesses with financial payment.

It is necessary to create a unified information environment for effective control of PREC. The information environment intended to organise a single platform to obtaining variety of information from the different data sources. It will bring together, to structure and ensure the functioning and development PREC. Integration of heterogeneous data is essential for control.

The results of analysis show that the educational system has certain structural complexities. Higher Technical School is isolated from science and industry. It is necessary to integrate the results of scientific activities and into education and production. It is also necessary to conduct system work on finding competitive models of innovation development of universities.

CONCLUSION

- It is necessary to create new educational organisational structures appropriate rate of economic development, education, technology, and society as a whole.
- Modern educational systems should include the educational, research units and structures providing innovation activity of universities and their close cooperation with the industry.
- It is necessary to create a unified information environment for effective control of the educational complex.

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Ключевые слова: болонский процесс; образовательная система; структура образовательной системы; образовательный комплекс; многоуровневая подготовка кадров; организационная структура; единая информационная среда.

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