

# Problem situations in Engineering education

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**The article suggests a competence and qualification approach to formation of engineering training innovative model. The approach takes into account a regional component and is based on integration of cluster interaction of continuing education participants.**

**Key words:** *innovative engineering training, competence and qualification approach, cluster, human recourse, real economy.*



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In the post-industrial age society has accumulated a scope of basic and applied knowledge, a huge information resource has been developed. Today the main objective is to create new competitive products and new markets by applying knowledge management principles. Innovation in technology is being formed on an interdisciplinary basis as a result of the transfer of knowledge from one area to another. Distribution and combination of basic and applied knowledge, and moreover their use in an "unexpected way" for all practical purposes becomes the main purpose for engineer in his innovative activities.

In this context, a new approach in engineering education has been developed. Innovative engineering education is the process and the result of purposeful formation and development of specific knowledge, skills and methodological culture, as well as complex training of specialists in the field of engineering and technology for innovative engineering activities through appropriate content, tools and technologies [1].

Nowadays a lot of experts hope that Russian high quality engineering education could be saved if two main problems were solved. First of all, we need to strengthen cooperation between

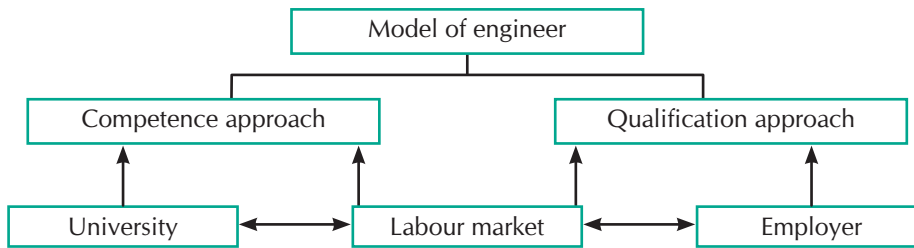
technical universities and real economy, provide bilateral contacts of universities with industry, employers and market. Development and introduction of federal state educational standards (as well as educational programs) for new generation tends is one of priorities.

It is undoubtedly true, but, in our opinion, it is necessary to start with the development of a modern engineer model I on the basis of competence and qualification approach (Fig. 1), and key competencies definition of future specialists for different sectors of economy (Fig. 2).

There is no coincidence that resolution of the 15th Congress of the Russian Union of Industrialists and Entrepreneurs (RSPP, Moscow, 18.04.2006) points out the need of further development of the positive results in the reform of vocational education, development of partnership between government and business in this area. The Russian Union of Industrialists and Entrepreneurs took the initiative to develop professional standards. Though there are not any professional standards, universities need to train according to the new federal state educational standards.

Education process in accordance with the competency-based learning

**Fig. 1. Mechanism to develop a modern engineer model**



**Fig. 2. Key competencies of a modern engineer**



model will eliminate such shortcoming in the training of engineers as “knows everything, but cannot do anything”. It will permit to implement a problem-based approach with the use of IT-technologies. This approach allows students to focus on the analysis and solution of real specific problems.

Engineering education should be aligned to the needs of specific region and its socio-economic development. Development of the regional economy refers to the search of sources and directions of effectiveness based on the growth of material well-being of citizens and quality of their lives. The methodology of the social concept is based on improving the quality of life and ensuring the proportions of regional industries, which contribute to achieving the strategic goals of sustainable development of the region. Therefore, the modernization of the economy of the region, obviously, should be based on human resources and cannot be implemented without modernization of engineering education as an important condition for quality training of human resources.

Modernization of higher engineering education in Russia, as well as many other national socio-economic objectives should initially be solved on the regional level. Thus, the main goal of higher education institutions is to train quali-

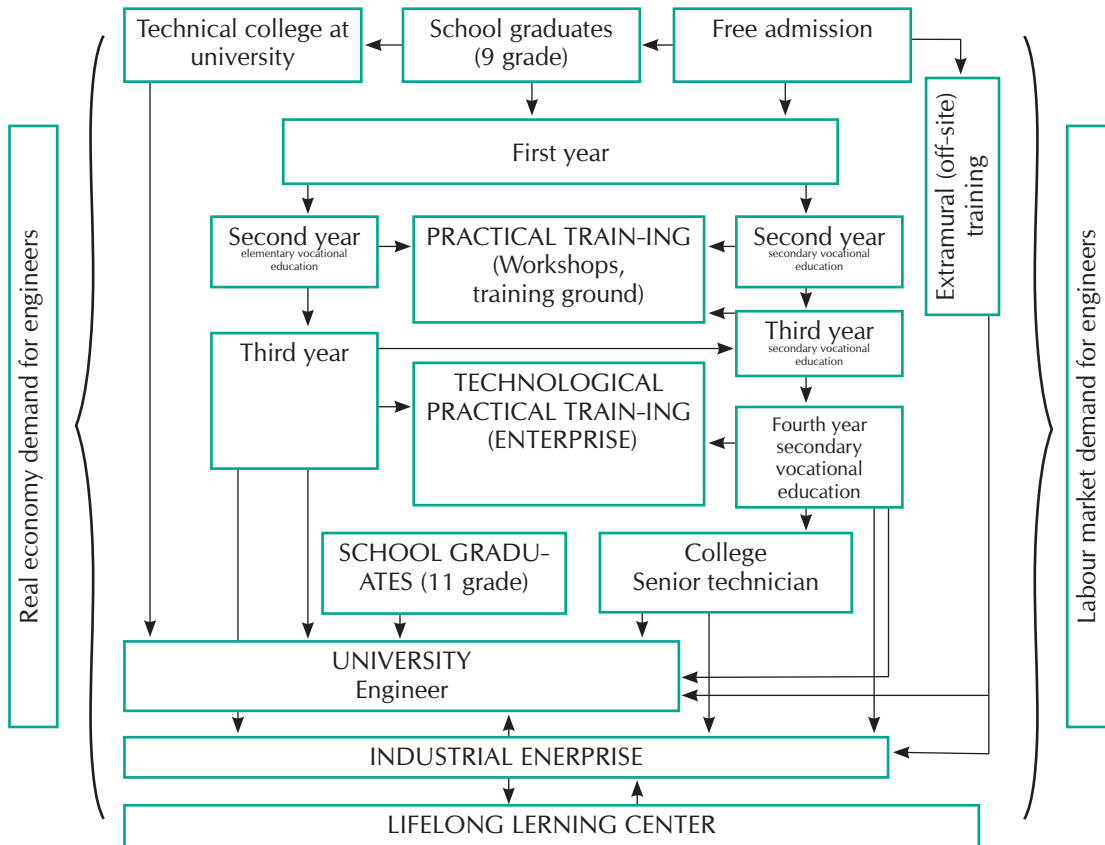
fied engineering staff required by real economy of particular region.

Due to the fact that at the present time industry requirements for employees are constantly changing lifelong learning becomes the norm. And the ability to acquire new knowledge and skills is considered as the most important characteristic of the labor force.

Combination of region's need in engineering staff and the ability of human resources to train permanently allows to create a cluster of engineering education, embracing higher education institution, vocational education institution, technical high school at university, school, faculty of advanced training, sector of the economy (Fig . 3).

Development of regional engineering education cluster will permit to implement the strategy of a “double loop” in preparation of competitive engineering staff. The modernization of engineering education should be completed according to the principle “first think what would happen, and then do”. But it does not happen in reality. Under these conditions, universities should have a certain extent of independence and mobility, whereas industrial enterprises should be given relevant operational rights for cooperation with universities as well as governmental support without bureaucratic delays.

**Fig. 3. Model of engineering education cluster**



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