

Engineering education development in federal university

*Kazan (Volga Region) Federal University
N.F. Kashapov, A.M. Galimov*

The paper examines the questions concerning the development of multilevel engineering education system in a federal university in terms of Kazan (Volga Region) Federal University. The proposed model of engineering education, which is based on the fundamental training and project-oriented Master's programs, is considered by the authors as a necessary condition to increase innovative capability of federal university.

Key words: *engineering education, innovative activity, educational cluster.*



N.F. Kashapov



A.M. Galimov

Development of engineering education in the Russian Federation is nowadays mainly carried out with reference to the priority areas of science, technology and engineering, and critical technologies of Russian Federation. In this regard, President of the Russian Federation approved a Decree «on the approval of the priority areas of science, technology and engineering in the Russian Federation and the list of critical technologies of the Russian Federation» dated July 7, 2011 № 899 [1]. Being a special educational institution and playing a leading role in higher education federal universities cannot stay away from such crucial for the country activities. We can say that the development of engineering education at federal universities, in particular in the Kazan (Volga) Federal University (hereinafter KFU), is needed not only for training of engineers in certain sectors of the economy of the region and country, but above all, to maintain and develop innovative activity and engineering

and technological capabilities of the university.

In the approved by the Russian Government development programs of federal universities one can find activities and evaluation criteria that are directly related to engineering and technology component of the scientific and educational activities. For example, the development program of Kazan (Volga) Federal University includes the following evaluation criteria: proportion of funds obtained through the implementation of research and development activities in the total income of the University; number of registered intellectual property; number of license agreements; number of small innovative enterprises operating in the innovation system of the university; annual turnover of small innovative enterprises founded by university.

Almost all priority areas of science, technology and engineering in Russia and the critical technologies are already being implemented at KFU within the framework of activities to promote in-

novation at the university. However, results achieved under completing the development program at KFU still do not create atmosphere of full confidence that KFU innovation infrastructure is sufficient for the successful transfer of knowledge and technology in the broadest sense. There is still lack of confidence that KFU innovation infrastructure is mature enough to be a self-reproducing system of innovative products, as well as has enough resources for their successful commercialization. We believe that another factor for innovations development at university, that is unfortunately not included in the official program of KFU, is the availability of engineering education. Engineering education at federal university should not be regarded as the mass training of engineers for manufacturing companies. This is a matter of technical and technological universities. From our point of view development of engineering education at federal (classical) universities is required mostly for improvement of innovation infrastructure of the university. Engineering education should help in creating at federal universities appropriate environment and conditions for research and development, as well as to strengthen cooperation links of higher education institution with the real economy.

The main idea of our proposal is to train Masters in Engineering and Technology on the basis of classical university undergraduate (bachelor) education. At the moment KFU has been developing the concept of engineering education which will determine development priorities that meet the requirements of the region and country, taking into account capabilities and capacities of the university.

Experts point out that now, when the country begins to develop nanotechnology industry where engineering education plays a vital role, the need for deep fundamental training of engineers is becoming more obvious.

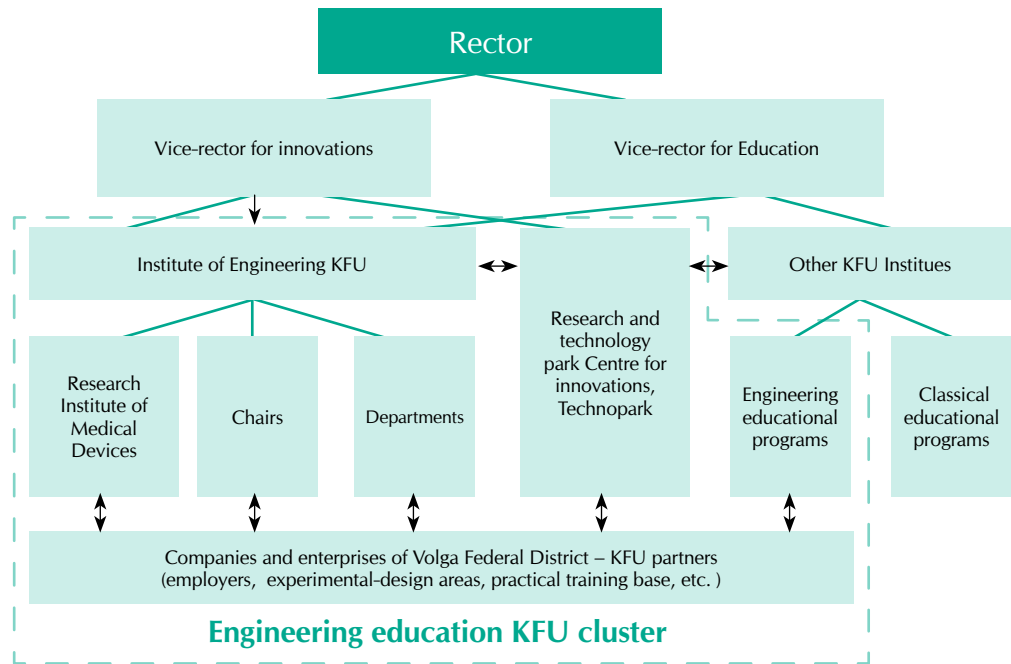
Let us consider two possible ways of development of engineering education at federal universities. The first one

deals with creation of separate educational and research engineering unit as the base for developing engineering education. This option seems to be labour and time-consuming, and looks like it resembles or even duplicates the functions of existing engineering schools. Second way deals with distributed implementation of engineering programs, primarily master programs, on the basis of various training units along with establishment of coordinating centre or cluster for the whole university. Main objective of this approach is to train masters in engineering and technology based on the classical university undergraduate education.

We find the second approach more successful. The proposed model (Fig. 1) of engineering education development at federal universities tends to be more perspective and is based on the following principles:

- Multi-level training of engineers: basic training at bachelor level (classical university education) and specific training at master level (engineering program). Graduates of different universities of Volga Federal District (VFD) will be able to apply for admission to Master programs in engineering on a competitive basis, as well as for university places funded by business representatives of VFD.
- Practically oriented master training in the field of engineering and technology depends on close cooperation with industrial companies of VFD. Master programs are designed to meet requirements and solve real engineering problems VFD companies. Educational programs are developed and implemented on a project basis involving experts from VFD enterprises. Due to the fact that graduates will be trained to make specific engineering decisions, employment rate will increase and graduates will be able to solve real engineering problems that companies of VFD face with.

Fig. 1. Model of engineering education at KFU



- Cluster technology for organization and implementation of training programs for engineers. Development of close partnership with universities of Volga Federal District for students and faculty mobility. Universities and enterprises belonging to the cluster will sign agreements on cooperation and sharing of teaching laboratory, research and production facilities as part of the engineering programs. Joint engineering centres, technology parks, innovation support funds, etc. should be established
- Credit-modular technology training, allowing students to choose the trajectory of learning (in different institutions), taking into account the proposals of the labour market. Modular technology lets you quickly adapt educational programs to the current problems of engineering, credit technology will increase students mobility

The first stage of engineering education development at KFU is focused on the implementation of programs related to the automobile industry and the development of medical devices. Therefore the possibility of creating engineering centre «Design engineering and technology for the automobile industry» is considered, as well as the establishment of the Institute of engineering with a research project institute of medical devices within university structure. Thus, professional engineers trained at KFU aware of latest research achievements will be able to find develop solutions of engineering problems of the real economy. Within the educational process graduates of engineering educational programs will participate in design and development, testing, production or maintenance of high-tech innovative products and technologies. Their research, educational and project activity is the link between fundamental scientific developments and their commercialization.

REFERENCES

1. Decree «On the Approval of the Priority Areas of Science, Technology and Engineering in the Russian Federation and the List of Critical Technologies of the Russian Federation» dated July 7, 2011 № 899/ [electronic resource]: President Decree of the Russian Federation: official. web-site. - [M.], [2011]. - URL: [http://graph.document.kremlin.ru / page.aspx? 156 × 800](http://graph.document.kremlin.ru/page.aspx?156x800), free acces.
2. Antipov V.N. From invention to invention through innovation and creative thinking / V.A. Antipov, N.F. Kashapov, I.A. Nazmiev // Right of intelligence. Ownership. - 2011. - № 2. – p. 35-37.