HSR (LONDON),
HOUGHTON STREET REVIEW JOURNAL
ISSN: 2058-5519|Impact factor-15.9
http://houghtonstreetreview.com/index.php/hsr

CHALLENGES AND PROSPECTS OF HIGHER EDUCATION AND PRODUCTION COOPERATION

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Abstract. The work presents research results on developing recommendations for guidance on effectively organizing the integration of higher education and industry cooperation, developing mechanisms for the interaction of production and educational institutions in the development of the mechanical engineering sector, improving the quality of education and implementing personnel training, and forming a technology development strategy in the region.

Keywords: Recommendation, guidance, integration, cooperation, industry, higher education, interaction, production.

Introduction. It should be noted that the problem of technology transfer and commercialization of university intellectual activity results is faced not only by developing countries with a relatively weak higher education and science sector, but also by developed countries, such as the United Kingdom (the opinion that "Britain lacks intermediary institutions between universities and the market" [10, p. 266] is confirmed by international rating data: in 2017, according to the "Global Innovation 1000 Study," there is not a single British company among the top 25 most innovative companies in the world. In this regard, studying the experience of reforming the state support system for knowledge and technology transfer in a country with a strong research base is interesting and useful, considering the prospects for adapting best practices to our conditions.

The modern system of state financing of R&D in British universities, including the stimulation of knowledge exchange processes, technology transfer, and commercialization of scientific research results, has emerged as a result of a series of reforms carried out over the last few years, aimed at strengthening university ties with enterprises to increase market demand for innovations created in higher education institutions.

Thus, a new innovation support system was created in Great Britain, in which issues of state funding for knowledge exchange and technology transfer were separated into a separate body that does not deal with issues of regulating educational and scientific activities. In general, government funding for R&D in the UK is provided to higher education institutions in accordance with the so-called "dual support financing" system, which is implemented through two pathways to achieve two different goals (in England, both branches of "dual support" are accountable to UKRI).

It should be noted that similar schemes for financing innovations in universities are also applied in other European countries. For example, The Danish National Advanced Technology Foundation (DNATF) provides grants to projects involving at least one scientific organization and one enterprise under the following conditions: the scientific organization invests one-sixth of the necessary funding, a commercial company – one-third, and the Fund provides the remaining half of the amount. Each party invests its resources, which allows for the confirmation of serious intentions, but neither firms nor scientific organizations should subsequently return the amount paid by the state or grant the state the right to participate in ownership. This form of state support for innovative activity encourages commercial companies to establish long-term partnerships with educational and scientific

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organizations. Furthermore, the state's financial burden is reduced, and projects that are truly in demand by the market and have specific stakeholders in the private sector are implemented.

The purpose of the study is to develop recommendations for guidance on the effective organization of integration between higher education and industry.

Research methodology.

Rapid Foresight (fast foresight) is a version of the foresight methodology that allows for achieving representative results in a shorter timeframe than classic foresight technologies.

The Rapid Foresight methodology helps solve the following tasks: forecasting – forming a rapid collective view of possible development options for the research subject; designing – selecting optimal paths for the subject's development, including tools for its change; projecting – forming a collective language and options for understanding the subject under discussion, and programming – forming project groups ready to move toward the designated results.

Research results and their discussion. The work analyzes the above-described examples of state support for the creation and commercialization of innovations developed in universities, and based on this, it is recommended that, firstly, the state be involved in these processes, and secondly, the development of intermediary institutions for the transfer of knowledge and technologies is of high importance even for countries with a developed research base.

According to the press service of the Head of State, the task set before "Uzavtosanoat" JSC to produce 50-60 thousand budget cars and electric vehicles per year plays an important role in improving the social and economic well-being of the republic.

This industry is one of the leading in the national economy, accounting for 11% of industrial production. Special attention is paid to the implementation of electric vehicle production in Uzbekistan in the Strategy for the Transition of the Republic of Uzbekistan to a "Green" Economy for the period 2019-2030, as well as in the Concept of the Development Strategy of the Republic of Uzbekistan until 2035.

Further development of the automotive industry is also outlined in Cabinet of Ministers Resolution No. 812 dated December 29, 2020, which provides for the transition of "Uzavtosanoat" JSC to the production of passenger cars and motor vehicles with electric motors.

Currently, "Uzavtosanoat" JSC, together with foreign specialists, is developing a prototype of an electric vehicle based on "Labo." At the initial stage, electric vehicle components will be integrated into the vehicle instead of traditional ones (internal combustion engine, gearbox, crankshaft, etc.). Upon successful completion of the necessary tests (field and technical), the technology for implementing electric motors in locally produced cars will be transferred to other model lines of "Uzavtosanoat" JSC. The importance of conducting road tests lies in the fact that the hot climatic conditions of the Republic of Uzbekistan can negatively affect the performance of the electric motor and battery, thereby reducing the service life and increasing the risk of damage to parts that cannot withstand high "thermal conditions." In this regard, a cooling system corresponding to the republic's climatic conditions is also being developed.

At the same time, an analysis of materials and expert surveys in the automotive industry indicates the following factors hindering the full implementation of the electric vehicle industry:

– lack of qualified specialists in the field of electric vehicle production;

– the unwillingness of large electric vehicle manufacturers to operate in the territory of the Republic of Uzbekistan due to the lack of necessary raw materials, logistics, infrastructure, and a market;

– a short period of autonomous battery charge;

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– insufficient energy-intensive batteries in budget electric vehicle lines, which create problems for long-distance travel (for example, an electric vehicle has a 300 km mileage reserve, and the journey from Samarkand to Tashkent is approximately 350 km, which implies additional time spent on charging and the possibility of no power stations along the way);

– the lack of modern capacities, necessary raw materials, and the high cost of technology for local production of lithium-ion batteries;

– expensive equipment for producing electric vehicles (depending on the manufacturer, advanced conveyors range in price from 3 billion USD). USA).

Thus, for the production of electric vehicles in Uzbekistan, there are a number of issues that require further study. Among them:

– modernization of "Uzavtosanoat" JSC's production capacities to produce an additional line of cars with electric motors;

– introducing joint activities with startup companies for the production of electric vehicles under a national brand;

– partial modernization of the "Uzavtosanoat" JSC plant for the production of electric vehicles based on models (Labo, Damas, Spark, Cobalt, Gentra), with the supply of electric motors and energy-intensive batteries or localization of the production of the aforementioned components;

– development and implementation across the republic of power plants with capacities of 240 and 380 (using Fast Charging technology) Watts;

– consideration by leading Uzbek specialists in physics and other scientific fields of the issue of creating a prototype of a "revolutionary" electric motor that generates energy based on alternative fuels.

The paper noted the need to develop the electric vehicle industry by training new personnel directly from the university. To achieve this goal, it is necessary to develop a concept for the joint work of machine-building concerns with the Andijan Machine-Building Institute, as well as to commission new laboratories where students will be able to conduct tests and develop electrical machines.

Based on the aforementioned factors, we can conclude that the development of the automotive industry in Uzbekistan has great potential. Training qualified personnel, as well as the commissioning of new laboratories and industrial clusters, is an important factor.

Conclusions and proposal. Thus, based on the conducted research, recommendations were developed for guidance on the effective organization of integration between higher education and industry cooperation.

The integration of education, science, and production, the joint use of the potential of educational, scientific, and production organizations, is built on mutual interests and meets the strategic goals of all participants in this process, primarily in the field of personnel training and professional development, as well as the organization of joint research and the implementation of innovative technologies.

Integration processes have a wide range of different areas of activity and manifest themselves in the most diverse forms. The development and implementation of a strategy for mutually beneficial cooperation between enterprises and universities is the most important prerequisite for the successful activities of both parties. Strategic partnership provides the opportunity to: improve the quality of the educational process in the university, create fundamentally new conditions for the scientific research and educational-methodological work of teachers and students, increase the volume of R&D (scientific research work) and income received from the implementation of educational programs of additional professional education, including corporate ones.

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The specialization of student training for the needs of a specific enterprise can be carried out in various ways. The traditional approach consists of creating a specialized training and production center within the university itself, focused on the specifics of working at the partner enterprise.

The study identified 3 main steps:

The first step is to provide vocational guidance for schoolchildren regarding AndMI professions necessary for future work at UzAuto Motors JSC, and subsequently to organize pre-university training faculties that, in turn, prepare schoolchildren for university admission;

The second step is to organize the educational process at AndMI with the participation of UzAuto Motors. To do this, it is recommended to install equipment on the university grounds that is completely identical to what is used at the plant itself. The equipment on the university grounds will be used, firstly, for training students, and secondly, for them and AndMI employees to manufacture parts necessary for the production of the final products of UzAuto Motors. Accordingly, plant employees and university professors participate in the educational process. For final-year students in the "Mechanical Engineering" field, it is recommended to organize theoretical and practical classes taking into account the specifics of the plant's operations. Training in the future profession takes place both at the plant itself and in the university's training center. This will allow AndMI graduates to come to work at UzAuto Motors not as newcomers, but as ready-made specialists;

The third step is to organize special classes at the university for the retraining of specialists required for UzAuto Motors. In this case, the university will undertake an additional option to train personnel in vocational specialties. This model will also align with the university's plan to integrate with industrial enterprises.

Specialized centers at university sites will be particularly effective when they take the form of technology parks for many partner enterprises. This direction of integration between production and education is quite promising and will continue to develop.

The work recommends a new method for integrating the university with industry. In this case, it is proposed to revise the curricula in accordance with the "2+2+2" model, i.e., to create 2-year general (basic, fundamental) and 2-year specialized (practical-oriented) programs for undergraduate studies and 2-year advanced (narrow-profile) programs for graduate studies.

In this case, it is implied that in the new model, the teaching staff must be divided into several qualitatively different groups of employees. The first should consist of university staff (departmental staff) who will conduct traditional (basic) disciplines during the first two years of undergraduate students' studies. This group of teachers must be very well-versed in the content of the material being taught and possess pedagogical and methodological skills to improve the quality of educational material presentation. Scientific requirements for these employees may be minimal. The second group of instructors should consist of practicing instructors who are capable of specifying basic knowledge applicable to a specific specialty in specific student practice locations. For this group of personnel, scientific requirements may be low, provided they possess substantial practical work experience in the relevant specialty. These instructors are designed to provide specialized training for students during the final two years of undergraduate studies. These same individuals must oversee students' internships - both within the university and outside of it at UzAuto Motors plants. The third group of instructors must ensure the training of students in the master's program, for which they must meet high scientific standards or possess high practice-oriented competencies.

In this case, the main element should be the total introduction of basic departments, and all graduation papers should be prepared and defended only at them with the mandatory participation of UzAuto Motors representatives. Intra-university departments may engage with undergraduate and graduate students only if they have real production or scientific centers with appropriate technological

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equipment in their arsenal. The university's own base in the form of technology parks or other forms of education integration with industry allows for the training of specialists taking into account real scientific and production technologies.

As mentioned above, ensuring the employment of a university graduate after successful completion will be the primary motivation for obtaining higher education. In this regard, universities should primarily transition to targeted training, which initially guarantees a student's employment. At the same time, it is necessary to strive for UzAuto Motors to participate as much as possible in the process of organizing the student's internship and internship. Furthermore, the operation of base departments in various forms will allow for the employment of a significant portion of graduates at UzAuto Motors, and this "prize" will create reasonable competition among students with a corresponding increase in the quality of graduate training.

Among the base departments, there must be enterprises that are industry drivers of the region's economy. Even if there are no employment guarantees for this group of graduates, they will have a high guarantee of employment at other similar enterprises in the industry.

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