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FORMING OF RESEARCH UNIVERSITIES IN THE REPUBLIC OF KAZAKHSTAN AS A CONDITION FOR INNOVATIVE DEVELOPMENT. EXPERIENCE OF FOREIGN COUNTRIES

Abstract. Modernization of country's economy based on industrialization and innovative development of Kazakhstan presupposes a reform of the system of higher education oriented on integration of science and education. In the Message to the people of Kazakhstan "The Third Modernization of Kazakhstan: Global Competitiveness", the President of the Republic of Kazakhstan, N. Nazarbayev set a task of making education the centerpiece of a new model of economic growth.In the article there is a research of task concerning reforming universities in the Republic of Kazakhstan, so that university education meets the challenges of the growing globalization.

Thus, the system of higher education pays much attention to the world high ranking universities, which according to the definition of the World Bank are the research universities. Functioning of these universities enabled such countries as the United States, Britain, and Japan to increase their influence on international arena. They train not only highly qualified specialists and scientists, but carrying out the fundamental and applied research makes the positive contribution to country's socio-economic potential.

Research universities should become active points of innovative economy growth. They should be developed according to the special target programs, conduct scientific research at a very high level and ensure output of their results in practice.

The world practice convincingly proves that integration of education and science is the only effective form of training highly qualified specialists for science and production which implements the main principle of universities, such as "learning through research", since the main task of the research university is integration of scientific activity and educational process at all levels of higher and postgraduate education.

Key words: research universities, innovations, development, higher education, economics, science, production.

Introduction. In the context of global competitionthe importance of world high ranking research universities is growing in order to develop scientific and innovative system of the country with the support of a knowledge-based economy. Analysis of foreign experience shows that it is the research universities that become the key source of ideas for implementation of the globally competitive innovations by world's leading companies. Over the past two centuries the world leading research universities have been formed in Europe, the United States and a number of other countries specializing in the production of new knowledge and training of unique specialists in the conditions of breakthrough scientific and technological development.

Thus, the globalization of economy sends the new challenges for universities such as ensuring continuing education, the constant increase in the number of students as well as introduction of the new technologies and educational innovations, etc.

Such scholars as Clark [1] and Halsey [2] have written extensively on the pressures on universities in knowledge based economy and the response of universities to those changes is explained by Etzkowitz and Leydesdorff [3] and Becher and Trowler [4].

P. Senge considers an important and significant factor influencing the activity of universities, technological changes that give an opportunity to increase the potential for the development prospects of the organization in order to enhance the intellectual assets of universities [5]. Researcher R. Bowen

considers universities as academic organizations with unique characteristics that affect their ability to adapt due to the diversity of stakeholders, as well as the goals and objectives of corporate culture [6].

Also in their works such scientists as Martins and Pereira show that a higher level of scientific education brings a greater return for the country [7].

Informatization and strengthening of innovative activity as the technical and technological basis for the formation of information society is a national strategic resource for the development of economy, characterizing not only the overall level of the social and cultural development of the state, but also its place in the global process of the world development. It is not accidental that all the developed countries strive to create the most advanced information industry which is able to fully meet the levels of a request for the social development.

Lu Yongxiang "The high-tech economy develops due to knowledge and intellectual abilities of a person, so it is a form of economy that leads to the saving of resources, the coordinated interaction of a man with nature and also leads to the sustainable development" [8].

Among the most prestigious institutions of higher education in the world are the US universities.

Here are the main feature characteristic of a modern research:

- The faculty participates both in educational programs of the research university and in the scientific research (on average, 25-75% of work time is spent on teaching). It should be noted that a significant difference in the formation of the faculty of the best American universities is the rotation of personnel covering the spheres of education, science and business. And there aren't any barriers between them and moreover the payment system at university as well as at the firm stimulates such a rotation;

- research university constantly maintains a high level of research conducted in it including investing its financial resources in the development of its research base (library resources, information support, laboratory equipment, etc.);

- study at research university has become diverse and includes both, education of specialists with the award of PhD degree and acquisition of the basic higher education by students who do not plan in future to engage in scientific and educational activities professionally

Today the research universities actively participate in additional postgraduate education, mainly on a commercial basis offer the multilevel programs for advanced education and retraining. Unlike of narrow-profile commercial educational institutions universities have an opportunity to implement a variety of programs based on interdisciplinary approach.

At Stanford University a large-scale research is carried out covering virtually all fields of science. Graduates of university are a part of scientific and technical elite of the country; they have got Pulitzer and Nobel Prizes. The high results of the scientific education of university graduates are evidenced, for example, by the fact that more than 350 technology firms are based around the campus headed by the former university students. W. Hewlett and D. Packard also were once students at Stanford. According to many scientists there would be no Silicon Valley without Stanford University [9].

A feature of the high ranking research universities is availability of the mutually beneficial and useful links with industry. Relatively small in terms of students, but the world-renowned Massachusetts Institute of Technology (MIT) effectively cooperates with 700 leading US industrial corporations [10].

The tendency of MIT to link together the process of education and the search for the new knowledge provides scientific breakthroughs and technical achievements. The success of MIT in organizing and managing scientific research is evidenced by the fact that the annual economic benefit from the use of inventions and new technologies developed by this university is 20 billion dollars. By the number of patents, MIT leaves all other American universities behind. Only in 2016 MIT issued 110 licenses [10].

As a part of MIT's Center for Engineering biotechnological process there are Institute of Cambridge-MIT Center for Archaeological Materials, Center for Biomedical Engineering, Center for Cancer Research, Center for Research in Economics and Management, Center for Coordination Science, E-busi-ness Center, Center for Educational Computer Innovations, Center for Environmental Health, Center for Information Systems, Center for International Studies, Center for Space Exploration, Center for Clinical Research, Laboratory of Computer Science, Technology Innovation Center, Edgerton Center, Spectroscopic laboratory of George Russell Harrison, Observatory, Institute of Nanotechnology, Institute for Study of Labor and Employment, Laboratory of Electromagnetic and Electronic Systems, Laboratory for Financial Engineering, Laboratory of Nuclear Science, Laboratory of Microsystem Technology and others [10].

In 2000, President Clinton signed an executive order aimed at strengthening the relationship between nation's universities and the federal government by detailing guidelines for collaboration on research projects [11]. In accordance with this decree, the principles for strengthening partnership between the government and universities were developed.

Thus, the partnership in science and technology between the federal government and American universities has brought the great benefits that have become vitally important for both sides. It continues to be exceptionally productive, stimulating technological innovation, providing new discoveries, educating the next generation of scientists, improving the quality of life, making a significant contribution to American economy and the prosperity of society. To strengthen this cooperation, the executive order contains several basic principles that define the framework for the development and analysis of future federal policy in relation to the research university. They are:

- Research funding is a contribution to the future of the country;
- integration of education and research is vital;
- research should be conducted thoroughly.

The principles and fundamental functions which are followed by leading American universities and their experience can be used by the other institutions of higher education, research organizations that are engaged in private practice:

- financial transactions should be available publicly;
- periodic checks should be respected in accordance with the official rules;
- reasonable expenditure of funds for the research needs;
- the benefits of simple research policy should be correlated with the costs.

The modern research university is a large economic entity with financial autonomy. Research universities have become equal partners of business in integration of science, education and production and sometimes perform in the regions a role of the leading, main integrator and have got strong ties with industry.

The research university is an incentive for the development of science intensive production generating a demand for workers with the necessary knowledge and information: scientists, engineers, analysts, programmers, professional participants in financial markets, etc. On the other hand with increase in "intellectual share" of the created products will increase a demand and accordingly for workers in the scientific and research sphere [12].

And for today it is quite obvious that a significant investment in new knowledge is required thereby increasing the role of science in economy which becomes an important catalyst for the formation of knowledge-based economy. In fact, within the conditions of this development intellectual resources become the main productive force which is the basis of activity of the research university [13].

Thus, as foreign practice shows, the research university is becoming an important factor of technological and economic development in the region. The traditional functions of university is educating of future specialists, conducting the basic research and these everything is complemented by its active activities in transferring the new technologies to industry and business. Modern research universities have got the greatest potential and a range of impacts on the social practice following the development of an open model of interaction and cooperation with all the public institutions. The level of integration of education, science, production, and science-intensive technologies has become the decisive factors for the development and growth of the competitiveness of national economy.

In the light of the strategically important task set by the Head of State concerning building an effective scientific and innovation system and considering the foreign experience of the leading foreign universities in Kazakhstan the process of forming and developing a network of the research universities is underway. A legislative basis for their creation has been developed. Article 10 of the Law of PK "On Science" is devoted to the notion of "research university" [14].

The country also has a high potential for human resources within the framework of the «Bolashak» program and the activities of Nazarbayev Intellectual Schools. At the present stage of formation of the research universities there are simultaneous processes of differentiation of universities in Kazakhstan. Nine national universities have been singled out; In 2010 within the contest were identified 10 innovation-oriented universities and then they are expected to be transformed into the world leading research universities. Nazarbayev University was formed and graduated the first alumni. Also was formed Kazakh National Research University after K.Satpayev.

Nazarbayev University is international university established on initiative of the President of Kazakhstan with the goal of integrating education, science and production, creating an effective academic environment and conditions for an access of the domestic scientific structures into the world scientific space. In the Message of the President to the people of Kazakhstan dated 27th of January 2012 "Socio-economic modernization is the main vector of Kazakhstan's development" it was noted: "Nazarbayev University should develop intellectual and innovative cluster that will allow transferring and promotion of the new technologies" [15]. In 2015 Nazarbayev University was awarded the status of research university and approved its development program for 2016-2020.

Integrated scientific system of Nazarbayev University includes Astana National Laboratory and Nazarbayev University Research and Innovation System (NURIS), which generally provide a link between the academic process, research activities and the development of proposals and recommendations for introduction of research and development in production. One of NURIS' priorities is the creation of an intellectual-innovative cluster of Nazarbayev University within the development of high-tech companies.

The key elements of the cluster are schools and research centers, a commercialization office, business incubator, technopark and Astana Business Campus science park. Along with the scientific research and educational activities in the science park will be carried out engineering, pilot industrial and investment activities. In the field of scientific activity, the development of Nazarbayev University is carried out in two main directions. First, it is the development of science in the traditional sense, when scientific activity is formed mainly by the faculty and researchers. A prerequisite is a participation of undergraduates, graduates and postgraduate students in scientific projects.

Secondly, the scientific activity covers not only the interests of the research workers and faculty, but also takes considers the national scientific priorities of the republic. In accordance with the personnel policy Nazarbayev University purposefully supports employees who are committed to continue their studies in Master's and PhD programs as well as the postdoctoral research and scientific internships. On the basis of Nazarbayev University schools in accordance with international standards more than 60 modern laboratories have been created.

The strategic development of Nazarbayev University is based on international cooperation and partnership with the world leading educational institutions of the United States and Great Britain (Cambridge University, Duke University, University College London, University of Pennsylvania, etc.). The University uses experience of its partners in the development of educational programs for bachelor's, master's and doctoral studies, management of scientific and educational processes as well as in the development of scientific research. For today Nazarbayev University is the national brand of education, the first university in Kazakhstan working on international academic standards and guided by the principles of academic freedom and autonomy. Experience of Nazarbayev University is gradually broadcasted by all the universities of the country.

In December 2014 by the resolution of the Government of the Republic of Kazakhstan was formed a non-commercial joint-stock company "Kazakh National Research Technical University named after K. Satpayev " which included scientific organizations of the holding company " Parasat ". Dozens of educational and research institutes, more than 1000 scientists - academicians, doctors and candidates of sciences were concentrated in the new organizational structure. The range of actual scientific and technical problems solved by the specialists includes a production of nanostructured materials with the special physical and mechanical properties. Introduction into production of innovative technology of extraction and processing of non-ferrous ore metals and development of a fundamentally new technology to increase oil recovery and many other things [16].The President of Kazakhstan set the task to create the largest research center on the basis of the new university stressing that in the current conditions country's economy in a highly need of the qualified personnel especially engineering and technical staff.

Also in 2010 the status of innovative-oriented university in Kazakhstan was awarded to Karaganda State Technical University (KSTU) which is on the way to becoming a research university. The history and modern achievements of KSTU are inextricably linked with life and work of the Head of State N.Nazarbayev, his global initiatives and policy guidelines on issues of socio-economic modernization of the country. KSTU today is a large and effectively operating scientific and educational hub of Central Kazakhstan. In 2016 the university took the 2nd place in the national rating of country's technical universities and 111th in the QS rating "Developing countries in Europe and Central Asia". Innovative

scientific and technical complex of KSTU includes 7 research institutes, 185 research laboratories, 16 innovation centers of science and engineering, 7 engineering competence centers with the participation of the transnational corporations (TOTAL, FESTO, Schneider Electric, Mitsubishi Electric, Leica Geo-systems, Epam Systems, FLUOR), 6 centers of working professions, 4 small innovative enterprises and 4 mini-manufactures [17]. Orientation of educational process in KSTU to international standards provides a deep integration within the framework of "education - science - innovation" spheres . For effective implementation of this modern paradigm, the University Educational and Scientific-Production Cluster "Corporate University" was established and successfully operated in 2008, comprising 86 key enterprises and scientific centers of Kazakhstan, France, Germany, Austria, China, Russia, Belarus And Uzbekistan. Large enterprises of the region, such as ArcelorMittal Temirtau, Kazakhmys Corporation, Shubarkol Komir JSC, Karaganda Engineering Consortium LLP, KEGOC JSC, Saryarka ENERGY LLP, Varu Mining LLP, and others cooperate with 60 branches of university departments.

Relying on the powerful intellectual and production potential of the Corporate University, Karaganda State Technical University fulfills not only scientific and educational mission, but also is the most important social institution that can be used to form industrial and innovative infrastructure of the whole country.

Conclusion. Thus, today using examples of Nazarbayev University, Kazakh National Research Technical University named after K. Satpayev and Karaganda State Technical University, the following characteristics of the formation of Kazakhstan model of a research university can be singled out: a high potential of teaching and pedagogical staff; a unique cluster structure that allows to combine learning with research; a significant degree of integration with production and academic research institutes; advanced magistracy and doctoral studies; Developed scientific and educational infrastructure; a significant amount of budgetary and contractual funding for scientific and applied research; mutually beneficial relations and productive contacts with business concerning education of specialists, conducting and implementing of R&D; extensive scientific and educational international relations.

Analysis of problems connected with the forming of the research universities in our country shows a need for a new relationship between science and education on the one hand, and the state, university, industry and business on the other hand. Independent Kazakhstan will have to form the new mechanisms of a partnership between the state, society, education, industry and business, create the world leading research universities and keep the research university as the main source of new knowledge. In the long term perspective, the strategic goal of the research universities as well as in the foreign universities should be the creation and strengthening of mutually beneficial relations between business and university with an emphasis on the development of technology transfer, additional education and provision of the demanded specialists.

The research universities should take responsibility for the preservation and development of human resources in Kazakhstan science, a high technology and vocational training. They must acquire uniqueness and regional identity, becoming effective centers of science, education and culture as the leading foreign research universities.

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ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДА ЗЕРТТЕУ УНИВЕРСИТЕТТЕРІН ҚҰРУ ИННОВАЦИЯЛЫҚ ДАМУДЫҢ ШАРТЫ: ШЕТЕЛДІК ТӘЖІРИБЕ

Аннотация. Қазақстандағы индустрияландыру мен инновациялық дамуға негізделген ел экономикасын жаңғырту ғылым мен білімге бағдарланған жоғары мектеп жүйесін реформалауды да көздейді. Қазақстан Республикасының Президенті Н. Ә. Назарбаев «Қазақстанның үшінші жаңғыруы: жаһандық бәсекеге қабілеттілік» атты Қазақстан халқына Жолдауында білім беруді экономикалық дамудың жаңа моделінің орталық буыны ету міндетін алға қойған болатын.

Мақалада Қазақстан Республикасындағы университеттерді реформалау міндеті университеттік білімнің барған сайын күшеюдегі жаһандану қатерлеріне жауап беруі тұрғысында зерттелген.

Осылайша жоғары білім жүйесінде Дүниежүзілік банктің ұйғарымы бойынша, әлемдік деңгейдегі зерттеу университеттеріне айрықша назар аударылып отыр. Осындай университеттердің болуы АҚШ, Ұлыбритания, Жапония секілді елдердің әлемдік аренадағы беделін ұлғайтып отыр. Олар тек жоғары кәсіби мамандар мен ғалымдарды даярлап қана қоймай, сонымен бірге түбегейлі және қолданбалы зерттеулерді жүргізу арқылы елдің әлеуметтік-экономикалық әлеуетіне жоғары үлес қосуда. Зерттеу университеттері инновациялық экономиканың дамуындағы белсенді күшке айналуы тиіс. Олар арнайы мақсатты бағдарламалар бойынша дамып, аса жоғары деңгейдегі ғылыми зерттеулер жасауы және олардың нәтижесінің тәжірибе жүзіне асуын қамтамасыз етуі қажет.

Әлемдік тәжірибе білім мен ғылымның интеграциясы ғылым мен өндіріс үшін жоғары кәсіби мамандарды даярлаудың бірден бір тиімді формасы болып табылатынын тұжырымды түрде дәлелдеп отыр. Бұл университеттердің басты ұстанымы «зерттеу арқылы оқыту» бойынша жүзеге асырылуда, себебі зерттеу университеттерінің негізгі міндеті жоғары және жоғары оқу орнынан кейінгі білімнің барлық деңгейіндегі ғылыми қызмет пен білім беру үдерісінің интеграциясы болып табылады.

Түйін сөздер: зерттеу университеттері, инновациялар, даму, жоғары білім, экономика, ғылым.

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СОЗДАНИЕ ИССЛЕДОВАТЕЛЬСКИХ УНИВЕРСИТЕТОВ В РЕСПУБЛИКЕ КАЗАХСТАН КАК УСЛОВИЕ ИННОВАЦИОННОГО РАЗВИТИЯ: ЗАРУБЕЖНЫЙ ОПЫТ

Аннотация. Модернизация экономики страны, основанная на индустриализации и инновационном развитии Казахстана предполагает и реформацию системы высшей школы, ориентированной на интеграцию науки и образования. В Послании народу Казахстана «Третья модернизация Казахстана: глобальная конкурентоспособность» Президент Республики Казахстан Н.А. Назарбаев поставил задачу сделать образование центральным звеном новой модели экономического роста.

В статье исследована задача реформирования университетов в Республике Казахстан так, чтобы университетское образование отвечало вызовам растущей глобализации.

Таким образом, в системе высшего образования пристальное внимание обращено на университеты мирового класса, которыми, по определению Всемирного банка, выступают исследовательские университеты. Именно их наличие позволило таким странам, как США, Великобритания, Япония увеличивать свое влияние на международной арене. Они не только ведут подготовку высококвалифицированных специалистов и ученых, но и, проводя фундаментальные и прикладные исследования, вносят положительный вклад в социально-экономический потенциал страны. Исследовательские университеты должны стать активными точками роста инновационной экономики. Они должны развиваться по специальным целевым программам, проводить научные исследования на очень высоком уровне и обеспечивать выход их результатов в практику.

Мировая практика убедительно доказывает, что интеграция образования и науки является единственной эффективной формой подготовки высококвалифицированных специалистов для науки и производства, которая реализует основной принцип университетов – «обучение через исследование», так как основной задачей исследовательского университета является интеграция научной деятельности и образовательного процесса на всех уровнях высшего и послевузовского образования.

Ключевые слова: исследовательские университеты, инновации, развитие, высшее образование, экономика, наука, производство.

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