

ACTUAL PROBLEMS OF INNOVATION PROCESS IN UNIVERSITY EDUCATION OF MONGOLIA

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I. CONCEPT OF KNOWLEDGE INNOVATION IN 21ST CENTURY

Science-based innovations have played an important role in the society for centuries. The 21st century is characterized by the rapid economic growth in science and technology in most countries of the world. Introducing innovation to the political system as well as to all spheres of economic and social life of the country is obviously one of the examples of actions toward world unity, or in narrow sense toward progress of human community. Today, it has become obvious that in order to co-exist in peace peoples of different nations need to endeavor sustainability in the development. Sustainable Development cannot succeed without due knowledge of those aspects of the human society and natural factors that maintain balance between them and contribute to the equilibrium of the world.

Knowledge itself is a basis of the development, and a main driver of growth, a major determinant of competitiveness in the global economy. Knowledge, both as technical know-how and any kind of information, has been important to mankind for improving the quality of life. What have changed over centuries, however, are the characteristics and the quality of knowledge, the relative importance of science as its source, the methods by which it is created, stored, accessed, transmitted, acquired and retrieved, and its relative importance as a production factor.¹

Responding to the worldwide introduction of innovation systems into the national structures, Mongolia follows the path which the world is inclining towards. The term

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1 Kemal Gürüz, President of the Council of Higher Education of Turkey and Namik Kemal Pak President of the Scientific and Technical Research Council of Turkey. Conference on “Education; Lifelong Learning and the Knowledge Economy”, Stuttgart, October 9-10, 2002.

“**innovation**” whose common definition means the introduction of a new idea, method, or device², is described in the Law of Mongolia on Science and Technology, 2006, as “transformation of the results and products of researchers and introducing the end product to industries and services”. The state policy of Mongolia to store and develop national innovation system is to form a triple helix between scientific, business and Government organizations. In other words, research, business and policy are being brought together to form a harmony. Science and technology is not just a knowledge producer and riches of the society. It is also one of basic foundations of development of a State.

II. INNOVATION PROCESS IN UNIVERSITY EDUCATION SYSTEM OF MONGOLIA

“The most important task, if we are to save the Earth, is to educate”
Sir Peter Scott (1909-1989), English conservationist, WWF founder

In the 21st century Mongolian science and technology follows the primary principle to be a nation developing science based on new knowledge and advanced technology, to practice the national innovation system as a driving force for social and economic development for 2020, and to ensure secure and quality living of the people by creating and producing advanced knowledge and by continuously supporting the science and technology progress and development. Currently, Mongolia’s knowledge based economy index is 4.23, which is 35.6 percent higher than it was 12 years ago. In comparison to a study carried out by the World Bank, the average index in South East Asia is 3.63, Uzbekistan 3.27, Vietnam 3.10, Kazakhstan 4.5 and PR of China 4.23. According to the Global Competitiveness Report 2014-2015, 35th Edition (2014), World Economic Forum, that assesses the competitiveness landscape of 144 economies, has ranked Mongolia with population 3.9 million at the 98th place. Competitiveness of countries has been summarized in 12 pillars, where the 5th pillar is Higher education and training (value – 2.9; rank – 116 out of 144) that assesses the quality of education system and quality of mathematics (value - 4.5) and science education (value - 4.6).

United Nations General Assembly emphasized in its Resolution 57/254 (2002) on

declaration of the Decade of Education for Sustainable Development (2005-2014) that education is a motor for change. Within the framework of the endeavors to fulfill the goals set forth in the documents of the Resolution, experts of UNESCO did comprehensive surveys of the science and technology sectors of Mongolia from 2003 to 2005, and consequently the Master Plan of Science and Technology 2007-2020 was developed. UNESCO has been supporting the Government of Mongolia in implementation of this Master Plan that has perspective for Mongolia to have a competitive R&D (Research and Development) sector and an effective national innovation system providing intellectual property protection. Mongolia plans to develop further its international cooperation in science and technology on the new progressive level. The Master Plan is now used as the tool to develop Mongolia’s science and technology sector. The “National Innovation development program of Mongolia” (2008-2015), one of its consisting chapters, emphasizes the support of academic and research work at state owned higher education institutions, was adopted by the Government of Mongolia in 2008. In particular, National Program that endeavors to foster science–industry cooperation and joint research consists of 4 sub chapters.

1. Chapter on establishing an innovation structure;
2. Chapter on developing advanced technology;
3. Chapter on supporting academic and research work at state owned higher education institutions;
4. Chapter on preparing young researchers.

With respect to the content of these chapters, they all emphasize the importance of improving of knowledge and knowledge providing institutions. The documents of the European Union Commission “Role of higher education institutions in European knowledge world” that has been discussed within science and higher education institutions says, “ The most important 4 elements that provide knowledge driven society and knowledge economy are the following: (i) to build knowledge driven from the major scientific research studies, (ii) to offer good education based on scientific knowledge, (iii) to distribute knowledge in society using ICT technology, (iv) to implement, innovation and new technology, to apply newly obtained knowledge in manufacturing the products as soon as possible. It underlined the role of higher education institutions in flexible interconnection of these 4 elements.

The mission of the science and technology of Mongolia has been determined in the

² Susan C. White, Theodore S. Glickman. “Innovation in Higher Education: Implications for the Future”, *New Directions for Higher Education*, 137, spring (2007), 97-98.

Master Plan as “to practice the effective management and finance systems based on the social and market demands, ensure ecological balance by supporting effective utilization of various sectors’ resources by facilitating effective education- science- industry collaboration, gaining comparative advantage through enhanced competitiveness of small and medium enterprises and by maintaining environmental and ecological balance”. The Master Plan highlights integration of research and education among the valuables of the innovation process.

University education of Mongolia has needed radical reforms in the quality of knowledge. While introduction of any changes is generally directed from the top toward the bottom, e.g. from administration policy to teaching staff and students, innovation is directed up-and-down. That is why some policymakers describe innovation in high education system as reformative innovation. They have suggested taking necessary measures to enhance reforms in two major fields: high education system; and university education.

In the innovation policy that is being implemented by the Ministry of Education, Culture and Science, the National University of Mongolia (NUM) and Mongolian University of Science of Technology (MUST) play a key role in introduction of innovations especially of scientific and technology importance. University education has become one of the global services as it creates new knowledge, provides with new knowledge, and introduces it into practice.

III. NATIONAL UNIVERSITY OF MONGOLIA

National University of Mongolia is the first comprehensive university of Mongolia established in 1942. To implement the mission of Master Plan of Science and Technology, the NUM did reforms in its administration structure. Board of Trustees is the highest self-governing body consisted of representatives of founders, professors, students and graduates. The president of the NUM implements the administration of the University in cooperation with the heads of faculties and administrative units of the University. As for the winter semester of 2014-2015 Academic year, the number of enrolled students is 22478, where undergraduates are 17953; graduate students in Master’s Program – 3186; and the involved in Doctoral Program – 1029. The University provides various programs to 310 international students.

After the structural reforms, NUM has now five Schools (School of Sciences, School of Applied Sciences and Engineering, Business School, School of Law, School of International Relations and Public Administration) comparing to 12 Schools and faculties before 2014 and

two branch Schools (Orkhon School and Zavkhan School) with 746 full time professors, 76 Associate professors, 54 part time professors (346 professors with academic titles) enrolled in 8 faculties. The University has been running 31 affiliated centers and institutes, and 2 affiliated high schools. The administration structure of NUM is now more responsible, and its units operate according to the principle of good governance. It is consisted of the Board of Trustees, President, and two Councils: Academic Council and Community Council. The Board of Trustees, consisted of the representatives of founders, professors, students and graduates, is a self-governing body is responsible for the adoption of the university development policy, plan and programs (curricula), and adoption of or making amendments to the Charter of the university; setting of the university structure, organization, staff and amount of salary fund based on the proposals of the university president; making investment, allocation of annual budget and control over expenses; discussing and evaluating of the university activity reports and providing transparency.

The President of the University is a head of the Academic Council that is composed of the science professors. The Academic Council is responsible for the following tasks: discuss the development and strategy policies’ matters and curricula, and submit the proposals to the Board of Trustees; submit proposals on amendments to the Charter of the University to the Board of Trustees; discuss the rules related to the academic study and submit proposals on amendments to the Administration of the University; discuss the academic year report, grant scientific degrees and awards and submit proposals regarding the activity of the President to the Board of Trustees. The President of the University performs its functions with the assistance and cooperation of the four vice presidents responsible for Academic Affairs, Research and Innovation, Economic and Development Policy, and International Relations and Cooperation.

With respect to the topic of the presentation it should be noted that the position of the vice president for the research and innovation is an example of innovation in the structure of the University. The vice president administers and coordinates the activities of the Department of Research and Innovation, Technology Transfer Office and Graduate School. The Department of Research and Innovation is responsible for assisting students and researchers at NUM in developing of a research and innovation policy and strategic plans for NUM; identification and exploitation of alternative sources of funding for research, conducted by NUM; building of capacity in proposal development, project implementation and report writing (includes publishing in peer reviewed journals); developing of a University wide mentoring program

for junior scientists and researchers; and promoting collaboration among university-industry-government as a triple helix.

NUM is commencing a major initiative to strengthen its research capability and quality of curriculum, which is to better suit goals of the Master of Science and Technology focusing on advancement of the collaborative ties with business and academic community. The NUM aims to become a national model research University which meets world standards and provides pillars for Mongolia's development. To realize this goal, 152 curricula were re-edited to develop 70 new curricula that entirely comply with the innovation strategy of the NUM, meet contemporary social needs and suit to the world development tendencies. The fundamental output of higher education is knowledge, whether it is new knowledge discovered through basic research conducted by faculty and students or the knowledge transferred from faculty to students and from faculty to society at large³. As our knowledge base grows, the overall productivity ratio must increase if the cost of the inputs—facilities, faculty salaries, support staff, and ancillary programs—holds steady or declines (that is, the funding remains constant or drops). In short, institutions of higher education must exhibit productivity gains to survive in the current environment. Universities must continually seek ways to innovate and thereby deliver increased productivity through gains in operating efficiencies. Institutions have sought such improvements in several ways: outsourcing of additional services, developing consortia to support a broad variety of academic programs, using technology better, and matching inputs and outputs more closely". The new curricula of the NUM are focused on providing of progressive or world standard knowledge to students.

In international practice the higher education capacity is assessed by the number of Nobel Prizes, inventions done in the fields of mathematics and natural sciences, the number of created new technologies, obtained patents and licenses, the number of researchers and scholars whose works are referred to in the leading international journals publications. Last academic year, more than 54 author/researchers published research works in high ranked international journals with Thomson Reuter /Jefferies CRB Index, and some of them were referred from 1-6 times in publications and works of the professors and researchers of other countries. Number of the research articles of 12 NUM researchers as the re-print or corresponding authors published in international journals was 19. If compare to the publications of researchers of the Mongolian National University of Sciences and Technology (23) or Medical University (31) in international journals with Thomson Reuter /Jefferies CRB Index, this number does

not seem to be a smaller amount. 29,7% of all research works done in Mongolia in 2013-2014 were performed by the professors of the NUM, whereas 39.5% were performed by the researchers of the state-owned universities and schools, and 30,8 by the Academy of Sciences. Up to date, the NUM has implemented four innovation projects, 36 fundamental research works, 7 scientific and technological projects, 36 foreign projects, 27 contract researches, and 8 University projects.

Leading professors have been conducting advanced researches in main fields of natural and applied sciences, social sciences and humanity emerged in cooperation with national and foreign scholars within the framework of the international cooperation policy of the NUM. It has cooperation agreements with more than 129 academic and research centres all over the world. The NUM successfully continues the already established international relations with foreign partners, and endeavours to implement new projects with respect to the innovation policy of the university. NUM is a member of such organizations as Consortium of Mongolian Universities and Colleges (CMUC), International Association of Universities (IAU), University Mobility in Asia and Pacific (UMAP), Council on International Educational Exchange (CIEE), and Euro-Asian University Network (EAUN). In the Academic year 2013-2014, the NUM signed cooperation agreements with 8 foreign Universities (University of Le Havre, France; Griffith University, Australia; L.N. Gumilev Eurasian National University, Kazakhstan; Jun Von University, Korea; Kookmin University, Korea; Missouri National University, U.S.; Nanhua University, Taipei; Niigata University, Japan).

NUM recognizes the importance of fostering the development and utilization of innovation, and that the proper management and protection of innovation as intellectual property (IP) is an essential endeavour to promote and advance the University's mission. In March 2011, NUM established a Technology Transfer Office (TTO) responsible for protecting managing and National University of Mongolia licensing the intellectual property of NUM, including inventions in the nanotechnology, life science, information communication technology and physical sciences sectors, copyright protected materials such as software and images, and tangible research materials. The TTO's mission is to promote and facilitate the transfer of NUM's innovations for the benefit of the University and the public. Faculties are responsible for reporting any discoveries or inventions that may have commercial value and any work that seems likely to produce such discoveries or inventions to the TTO.

Entrepreneurship education: Entrepreneurship means the transformation of an idea into an enterprise that creates value—economic, social, cultural or intellectual. NUM strongly

³ Ibid, 107.

focuses on the entrepreneurship education to increase the intellectual capital and promote entrepreneurial abilities and creativity in Mongolia.

Within the structure of the University there are operating National Research Institutions:

- Institute for Mongolian Studies
- Institute of Mathematics
- Nuclear Research Centre
- Institute of Economics
- Institute for Sustainable Development

Scholars and researchers are enrolled in the NUM based research centres:

- Centre for Nano-science and Nanotechnology
- Mongolian National R&D Centre for Animation
- Research Centre for Chemistry and Technology of New Materials
- Coal Research Centre
- Geology and Mineral Resource Research Centre
- Geographic Information Systems Training and Research Centre
- Mobile and Embedded Technology Research Centre
- Centre for Research on Language Processing
- Computation Research Centre
- Water research Centre
- Centre for Development Research
- Training and Research Centre for Tourism
- The Population training and Research Centre
- Centre for Comparative and International Legal Studies
- Economic Research Centre

CONCLUSION

National University of Mongolia is eager to become a world-class institution of excellence in research, innovation and entrepreneurship for sustainable growth. The NUM has reached certain achievements in accomplishing of its mission with regard to the university education innovation policy, in particular, in creating knowledge in science and technology to help solve the global challenges of the 21st century; promotion of and maintaining excellence

in graduate education for individual students, faculty, departments and the University as a whole; contributing to innovation through technology transfer and entrepreneurship for sustainability in a socio-economic development, and fostering a culture of collaborative and innovative research that facilitates the production of socially relevant solutions and knowledge transmit.

The NUM attaches great importance to the continued reform of its provisions as it is regarded as the strategic vehicle for supporting the country's development of human resources able to adapt to the ever-changing social, economic, and technological conditions. However, for the future success, the NUM has been considering to take the following measures:

- Establish inter-universities technology transfer centre, enhance technology broker program, establish a mechanism to introduce research outputs to the production;
- Strengthen university-industry-business cooperation, stimulate industrial enterprises in creating students' internship basis;
- Establish flexible system responding to the needs of the ever developing science and technology, and labor market;
- Ensure academic freedom within the structural units of the university, strengthen the independence and impartiality of the activities, make reforms aimed at the formation of the accountability system;
- Enhance the service for students into the new quality level, improve and properly equip the research-based laboratories, establish comprehensive inter-sector laboratories of international standards, create e-libraries, enhance distant trainings;
- Achieve economically effective advanced level study programs; employ entirely the results of international relations and multilateral cooperation.

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