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**Foreign experience of the
commercialization of innovations
and their applicability in
Kazakhstan**

The commercialization of the scientific research results and innovations is very important for the economy of Kazakhstan at the present time. Strengthening links between science, production and business is required for the formation of an innovative economy, which in turn will contribute to the development of domestic science. Formation of the objects of innovation infrastructure began just a decade ago in our country. Therefore, it is necessary to study foreign experience in the commercialization of innovation, analyzing the advantages and disadvantages, as well as studying the possibility of their application in our country. The article considers the definition and classification of commercialization of innovations according to international scientific journals, as mechanisms for the distribution of profits from the commercialization of the invention practiced in European countries. The experience of developed countries in the organization of providing commercialization of technologies was analyzed. By analyzing these problems, a number of measures was identified which are necessary for the development in the field of commercialization of innovations in the Republic of Kazakhstan.

Key words: commercialization of innovations, the mechanism of technology commercialization, foreign experience of commercialization.

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**Инновацияларды
коммерцияландырудың
шетелдік тәжірибесі және оны
Қазақстанда қолдану
мүмкіндіктері**

Қазіргі таңда Қазақстан экономикасы үшін ғылыми-зерттеу жұмыстарының нәтижелері мен инновацияларды коммерцияландыру ерекше өзектілікке ие болып отыр. Инновациялық экономика құру жолында ғылым, өндіріс пен бизнес арасындағы байланысты нығайтып, отандық ғылымның дамуына серпін беру қажет. Еліміздегі инновациялық инфрақұрылым объектілері небәрі он жылдан астам уақыт бұрын құрыла бастады. Сондықтан инновацияларды коммерцияландырудағы озық шетел тәжірибесін зерттеп, оның артықшылықтары мен кемшіліктерін талдап, өз елімізде қолдану мүмкіндігін қарастыру қажеттілігі туындайды. Мақалада шетелдік ғылыми әдебиеттерде инновацияларды коммерцияландыру ұғымына берілген анықтама мен оның жіктелімі, Еуропа елдеріндегі коммерцияландырылған өнертабыстан түскен пайданы бөлу механизмі қарастырылған. Сондай-ақ, дамыған елдердегі технологияларды коммерцияландыруды ұйымдастырушылық қолдау құрылымы талданған. Көрсетілген мәселелерді талдау нәтижесінде Қазақстан Республикасы үшін инновацияларды коммерцияландыру саласын дамытудағы ең өзекті қадамдар анықталған.

Түйін сөздер: инновацияларды коммерцияландыру, технологияларды коммерцияландыру механизмі, коммерцияландырудың шетелдік тәжірибесі.

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**Зарубежный опыт
коммерциализации инноваций
и возможности их применения
в Казахстане**

На сегодняшний день коммерциализация результатов научно-исследовательских работ и инноваций представляет особую важность для экономики Казахстана. Для формирования инновационной экономики требуется укрепить связь между наукой, производством и бизнесом, что в свою очередь будет способствовать развитию отечественной науки. Формирование объектов инновационной инфраструктуры в нашей стране началось всего десять лет назад. Поэтому возникает необходимость исследования передового зарубежного опыта в коммерциализации инноваций, анализа преимуществ и недостатков, а также изучения возможности их применения в нашей стране. В статье рассмотрены дефиниция и классификация коммерциализации инноваций согласно зарубежным научным изданиям, также механизмы распределения прибыли от коммерциализации изобретения, практикуемые в странах Европы. Проанализирован опыт организационного обеспечения коммерциализации технологий в развитых странах мира. В результате анализа указанных проблем определен ряд необходимых мер для развития сферы коммерциализации инноваций в Республике Казахстан.

Ключевые слова: коммерциализация инноваций, механизм коммерциализации технологий, зарубежный опыт коммерциализации.

**FOREIGN
EXPERIENCE OF THE
COMMERCIALIZATION
OF INNOVATIONS AND
THEIR APPLICABILITY IN
KAZAKHSTAN**

Knowledge and innovation are key factors in economic growth. Generally associated with information technology or technological gadgets such as smart phones and tablet PCs, innovation encompasses much more and is often essential to advances in science, medicine, and pharmaceuticals, among several other areas. Successful technology commercialization can greatly increase country's economic competitiveness over the long-term through a systematic approach, with targeted interventions and support programs.

Kazakhstan is taking efforts in boosting innovation in science and business but there is significant challenge for scaling up and introduction of new instruments. The path to becoming an innovation-driven economy is not limited to one particular model – a country should develop its own model through experience and discovery. Therefore we should consider successful foreign experience in establishing innovation-driven economy and commercialization of innovations as its key factor.

Belying the idea that commercialization of innovation is a simple construct are the multiple definitions, conceptualizations, and operationalizations that have emerged across studies. Commercialization of innovation refers to the activities required for introducing an innovation to market. Experts measured commercialization of innovation as the early indication of commercialization, operationalized as the first sale of the target product or service. However, when an innovation is introduced in the market, only technology enthusiasts typically procure in the early stage, and such enthusiasts comprise less than three percent of the market. Reaching the mainstream market in this manner is often difficult, and the threshold for «successful» commercialization of an innovation will likely lie somewhere between these two extremes – single sale on the one hand and saturating the mainstream market on the other. We therefore define the ability to commercialize an innovation as a firm's capacity to bring a product into a market and reach the mainstream of the market beyond the initial adopters.

Innovation protection also emerged as a theme within the commercialization of innovations. While most of the articles concentrated on means of innovation protection, such as trademarks, patents and copyrights many linked protection with other themes such as innovation sources, innovation type, development, and

deployment. For an easier assimilation of the six themes that lead to the commercialization of innovations, following figure should be created (Figure 1). It shows how the six themes fit into the main activities of discovery, development, and

deployment that broadly describe the process of innovation commercialization. Depending on the scope of an innovation, a manager of a project can simply start from deployment of a prototype, seek customer feedback, and develop the innovation.

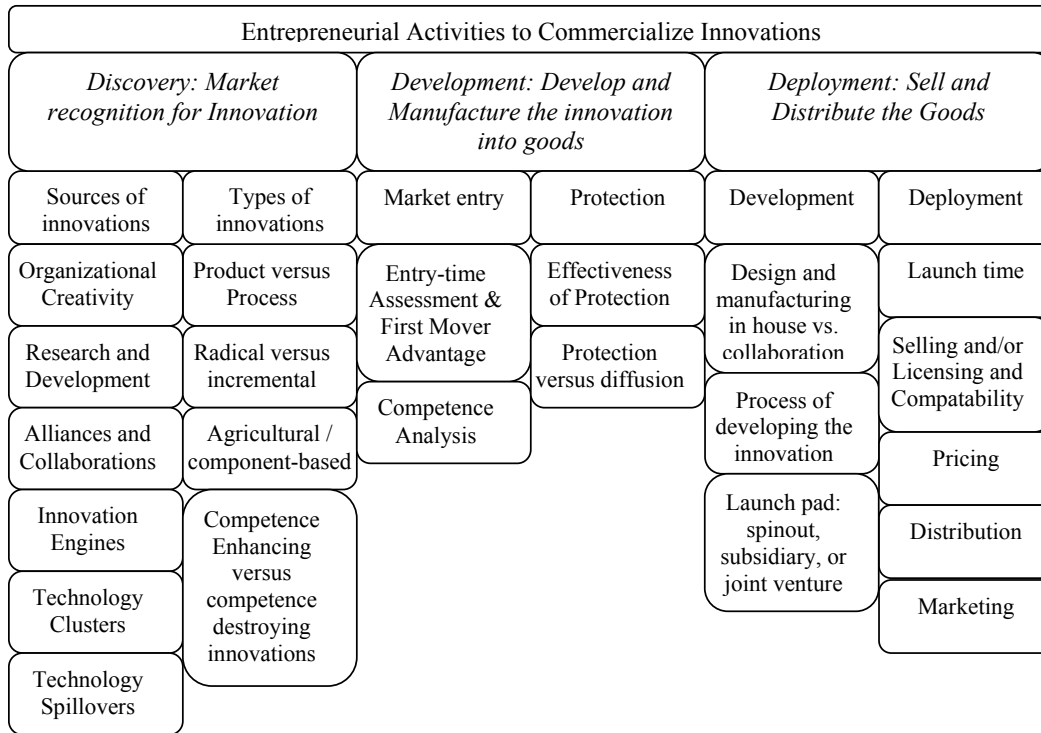


Figure 1 – Entrepreneurial steps to commercialization of innovations: themes from the extant literature [2]

Commercialization is an attempt to profit from innovation by incorporating new technologies into products, processes, and services and selling them in the marketplace. For many new technologies, commercialization implies scaling up from prototype to volume manufacturing and committing greater resources to marketing and sales activities. In industries such as pharmaceuticals and aircraft, commercialization is also contingent on receiving product approval from relevant organizations. Typically, the cost of commercialization activities far exceeds that of R&D. Many innovations are developed to the prototype stage or are produced in small volumes, but are not fully commercialized because the financial and managerial resources required are too great. Such innovations are often licensed to another firm, sold off in the form of a divestiture, or simply passed over [3].

Decisions to commercialize new technology are made by individual firms, but are closely linked to characteristics of the innovation system in which

the firm operates. Manufacturers must assess the likelihood of securing funding from internal and external sources, their ability to develop or gain access to manufacturing equipment and supplies, and the size of potential markets. Without the proper infrastructure to support their efforts, firms cannot be assured of winning returns from their investment, and competitors with a better support infrastructure may be able to capture the market. Pioneers in a new market often lose out to imitators with better financing, infrastructure, and strategy. Examples include EMI, Ltd.'s loss of the market for computer axial tomography (CAT) scanners to General Electric Co.; MITS's loss of the personal computer market to Apple and IBM; and U.S. firms' loss of much of the flat panel display industry to Japanese firms such as Sharp and Toshiba.

Efficient allocation of financial resources between projects and their performers also assumes the agreed (fair) distribution expected revenues between customer, contractor and customer

results projects. There are several approaches to building mechanisms of agreed expected income distribution: based on weighted level of labor costs intellectuality of the project participants, based on the distribution of agreed margins and others. The analysis of the conditions and prospects of commercialization of the research results shows the need for a radical practical measures by the

government to develop effective mechanisms financing of innovative systems based on motivating, maintain, develop and stimulate (rather than limiting and prohibiting) innovative activity approaches. The distribution of income from the commercialization of technologies is considered in Table 1, which is covered the overwhelming majority of European countries.

Table 1 – The distribution of income from the commercialization of technologies in European countries [4]

№	Country	Authors	Laboratories and departments	University	Technology transfer center	Other
1	Sweden	90	0	0	0	10
2	Portugal	63	6	29	2	0
3	South Korea	50	-	35	10	5
4	Ireland	47.8	23.2	18	11	0
5	Spain	47.6	15.2	32.6	4.3	0.3
6	Italy	47.3	8.6	39.6	4.5	0
7	Finland	46	20	30	-	0
8	United Kingdom	45.8	19.3	29.3	5.6	0
9	Israel	43.7	2.5	29	24.8	0
10	France	42.1	15.6	29.7	12.6	0
11	Other European countries	41.8	17.6	35.4	3.9	1.3
12	Austria	38.1	23.1	17.4	19.1	2.3
13	Norway	33.3	24.9	15.1	26.7	0
14	Germany	29.3	15.6	42.5	4.6	8
15	Switzerland	27.6	28.8	32.7	10.9	0
16	Netherlands	25.4	43.7	20.7	10.2	0
17	Denmark	25.3	24.9	49.8	0	0
18	Belgium	23.7	40.3	29.1	-	6.9

Organizational support of the innovation process depends on the characteristics of management and is inextricably linked to the legal and financial security. However, the solution of organizational problems does not exclude the creation of an innovative centralized management infrastructure to meet the requirements and conditions. Many countries have used the prescriptive approach to stimulating innovation processes at national and regional level (the regions are sometimes served as an object for the experiment). However, this approach may have the opposite effect without considering the needs of the market.

The successful solution of the tasks on the organization of an integrated system of infrastructure (legislative, financial and organizational) will

provide the necessary conditions to achieve world-class manufacturing intellectualization including the formation of the foundations of the post-industrial society. It is necessary to form sectoral and cross-sectoral infrastructure support of innovation in implementing the national projects.

Therefore, support and incentives should be implemented by improving the management of public organizations and the construction of the public-private partnership (PPP) mechanism. The data in Table 2 is the result of the analysis which allows to highlight the level of competence and protection of national interests, the involvement of business and society in innovation and technology commercialization.

Table 2 – The experience of organizational support of technology commercialization in developed countries [5]

The problem of organizational support	Mechanism of decision making	Implemented in countries
Sufficiency, excess or deficiency in the number of research institutes and scientists	The presence of the business sector, which owns 2/3 of the research capacity as a result of market regulators innovation – supply and demand	European Union
	The development of technology parks and tehnozons, technocomplex and diversified corporations	European Union
	The development of clusters of scientific associations, the so-called AN-institutions, integrating the capabilities of institutions and universities – points of sale technology	Germany
Interpenetration and fusion of science policy and technology with industry politics	Creation and development of new technology-holding companies, oriented to the needs of industry and the commercial market (support in patenting, licensing, establishment and development of spin-off companies, technology companies)	Sweden
State support of public and private initiatives	Development of the mechanism of PPP	Australia
	Higher Institutes of Technology as a «virtual» research institutes of actual companies and public research organizations	Netherlands
	Building partnerships, cluster networks and platforms for public-private cooperation	European Union
	State support for staff exchange	Germany
	Inter-ministerial program of cluster studies – seven programs aimed at improving the ability to collaborate across the research system and improve the reliability and flexibility of innovation; development of sector funds	Finland
The selection of highly profitable results to start the commercialization process	Design and development of the mechanism of innovation intermediaries between public R&D, academic research and private business – institutions of technology transfer	European Union United States

The main areas which require reform (including the implementation of national projects) are as follows:

- An effective national innovation policy and its implementation;
- Management of innovation systems;
- Development and support of innovative clusters within national innovation systems;
- The development and support of all members of the national innovation system;
- Creation and support of development of innovative communications and databases to facilitate cooperation and partnership in the national innovation system;
- Creating favorable conditions for patenting in the public sector;
- The introduction of tax incentives for R&D in the private sector.

The top 10 economies in the Global Innovation Index (GII) 2014 edition are Switzerland, the UK, Sweden, Finland, the Netherlands, the USA,

Singapore, Denmark, Luxembourg, and Hong Kong (China). Nine of these economies were already in the GII top 10 in 2013; Ireland, which was in the top 10 in 2013, dropped to 11th place this year, and Luxembourg climbed up into the top 10 from 12th position in 2013. Identifying the underlying conditions of a country and comparing performances among peers is the key to a good understanding of the implications of a country's ranking on the GII [6].

The remarkable stability of the top 25 and the steepness of the trend line between these top 25 and their middle-income followers is a phenomenon reflecting an inability of middle-income countries to compete with both high-skill economies and low-cost economies. To address this situation, knowledge-based growth strategies are required to encourage innovation and creativity through a supportive ecosystem. To reach that goal, these middle-income economies must closely monitor the quality of their innovation inputs and outputs as yet another tool to achieve innovation competitiveness.

The top three R&D-performing countries – United States, China, and Japan – accounted for over half of the estimated \$1.435 trillion in global R&D in 2011. The United States, the largest single R&D-performing country, accounted for just under 30% of the 2011 global total, down from 37% in 2001. The economies of East/Southeast and South Asia – including China, India, Japan, Malaysia, Singapore, South Korea, and Taiwan – represented 25% of the global R&D total in 2001 but accounted for 34% in 2011. China (15%) and Japan (10%) were the largest R&D performers in this group. The pace of real growth over the past 10 years in China's overall R&D remains exceptionally high at about 18% annually, adjusted for inflation. The European Union accounted for 22% total global R&D in 2011, down from 26% in 2001 [7].

Technology transfer from overseas through the exploitation of patents and licenses is considered a key part of Kazakhstan's catch-up strategy due to underdeveloped domestic knowledge capabilities. Government support will be available for both the application of foreign IPRs (so far only 4% of companies obtain technology through these channels), as well as to support the patenting procedures of domestic inventors abroad. The system will be operated through Kazakhstan's technology transfer network (including selected technoparks, and STI centres in chemistry, biotechnology and nuclear technologies), to support cooperation between domestic entities, as well as between foreign and local partners. It will therefore provide a mechanism to help match technology supply and demand, whilst also providing support to the commercialization projects of R&D institutes and companies.

Intellectual property rights (IPR) create basic incentives for the commercialization of research outputs and the development of industry-science linkages. Therefore, the authorities of Kazakhstan should aim to strengthen the role of intellectual property rights as a driver of the country's innovative development by:

- clearly defining the options for transferring of ownership of publicly funded research results from the state (government) to the (public or private) agent performing the research, down to the level of the individual inventor;

- establishing clear incentives for innovation by protecting the rights of researchers and scientists, while creating favourable conditions for the creation of firms based on the results of their research;

- providing precise guidelines that allow knowledge organizations to understand the opportunities and limitations of IPRs and offer guidance on how to deal with the different options. Based on this, organizations would be able to develop their own intellectual property guidelines, providing clear and strong incentives to the inventor.

The task of creating the innovation infrastructure, part of which should be a single national technology innovation commercialization, designed to combine the departments and agencies, research centers, research institutes, expert organizations, private business and become the basis for a new national intellectualization project to society as a basis for economic growth. Considered above issues of creating conditions for the development of innovative infrastructure for the commercialization of research results define the objective necessity for further comprehensive study the problem and search for constructive mechanisms for its decision.

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