**ҚАЗАҚСТАН РЕСПУБЛИКАСЫ**
**ҒЫЛЫМ ЖӘНЕ ЖОҒАРЫ БІЛІМ МИНИСТРЛІГІ**

**Л.Н. ГУМИЛЕВ АТЫНДАҒЫ ЕУРАЗИЯ ҰЛТТЫҚ УНИВЕРСИТЕТІ**
**КӨЛІК – ЭНЕРГЕТИКА ФАКУЛЬТЕТІ**

# *«КӨЛІК ЖӘНЕ ЭНЕРГЕТИКАНЫҢ ӨЗЕКТІ МӘСЕЛЕЛЕРІ: ИННОВАЦИЯЛЫҚ ШЕШУ ТӘСІЛДЕРІ» XI ХАЛЫҚАРАЛЫҚ ҒЫЛЫМИ-ТӘЖІРИБЕЛІК КОНФЕРЕНЦИЯСЫНЫҢ БАЯНДАМАЛАР ЖИНАҒЫ*

# *СБОРНИК МАТЕРИАЛОВ XI МЕЖДУНАРОДНОЙ НАУЧНО – ПРАКТИЧЕСКОЙ КОНФЕРЕНЦИИ: «АКТУАЛЬНЫЕ ПРОБЛЕМЫ ТРАНСПОРТА И ЭНЕРГЕТИКИ: ПУТИ ИХ ИННОВАЦИОННОГО РЕШЕНИЯ»*

# *PROCEEDINGS OF THE XI INTERNATIONAL SCIENTIFIC-PRACTICE CONFERENCE «ACTUAL PROBLEMS OF TRANSPORT AND ENERGY: THE WAYS OF ITS INNOVATIVE SOLUTIONS»*

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В сборник включены материалы XI Международной научно – практической конференции на тему: «Актуальные проблемы транспорта и энергетики: пути их инновационного решения», проходившей в г. Астана 16 марта 2023 года.

Тематика статей и докладов участников конференции посвящена актуальным вопросам организации перевозок, движения и эксплуатации транспорта, стандартизации, метрологии и сертификации, транспорту, транспортной техники и технологии, теплоэнергетики и электроэнергетики.

Материалы конференции дают отражение научной деятельности ведущих ученых дальнего и ближнего зарубежья, Республики Казахстан и могут быть полезными для докторантов, магистрантов и студентов.

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# CREATION AND COMMERCIALIZATION OF NEW KNOWLEDGE FOR USE IN INDUSTRY

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World experience shows that one of the main sources of new technologies and innovations, which no innovative economy can do without, is enterprises engaged in innovative activities. Innovative enterprises, along with research institutes, not only ensure the development of the scientific and technical sphere of countries, but are also of great importance for socio-economic development. Innovative enterprises create a healthy competitive environment, promote employment, replenish the state budget through taxes, create and maintain innovation activity in countries, and most importantly, ensure economic growth. Nevertheless, the effective development of an innovative economy is impossible without a program of innovation to consumers, meeting their needs and desires, i.e. bringing innovations to the market, which can be fully implemented through the commercialization of innovative products. In all developed countries of the world, the problem of commercialization of innovations is one of the central problems for effective innovation development. Its solution is not only the main condition for the successful implementation of innovation results, but also directly reflected in the international competition of national products.

The relevance of the research topic is determined by the importance of solving the problem of commercialization of innovative products for innovative enterprises. This is not enough for enterprises to develop innovations in a highly competitive environment, but their implementation in the market is necessary to maintain their effective development and competitiveness. Successful implementation of this task requires the development of a modern mechanism for bringing innovations to the market.

In the process of studying scientific, theoretical and methodological works on the basics of commercialization of innovations, the content, forms and essence of commercialization of innovations were studied at the first stage.

The innovative type of development of society assumes that innovations penetrate the entire fabric of society, in all spheres of human activity.

There are the following main types of innovations:

- ✓ technological innovations;
- ✓ environmental innovations;
- ✓ organizational and production innovations;
- ✓ management innovations

- ✓ military-strategic innovations;
- ✓ economic innovations;
- ✓ socio-political innovations;
- ✓ state-legal innovations;
- ✓ innovations in the spiritual sphere (science, culture, ethics, education, etc.)

Any innovation has a non-zero commercialization potential and a non-zero transfer potential.

An important parameter of innovation is the level of its novelty, which characterizes the scale and potential of commercialization. Therefore, allinnovationscanbedividedintoattributes:

- major innovations (radically changing the process or content of a particular area of human activity);
- improving innovations (significantly changing the processes under study and releasing a significant amount of material and labor resources););
- micro-innovations (changing the process or product only to a lesser extent or in a smaller local part).
- pseudo-innovation (either premature, destructive, or simply" galvanizing", that is, a temporary extension of an outdated, dying process).

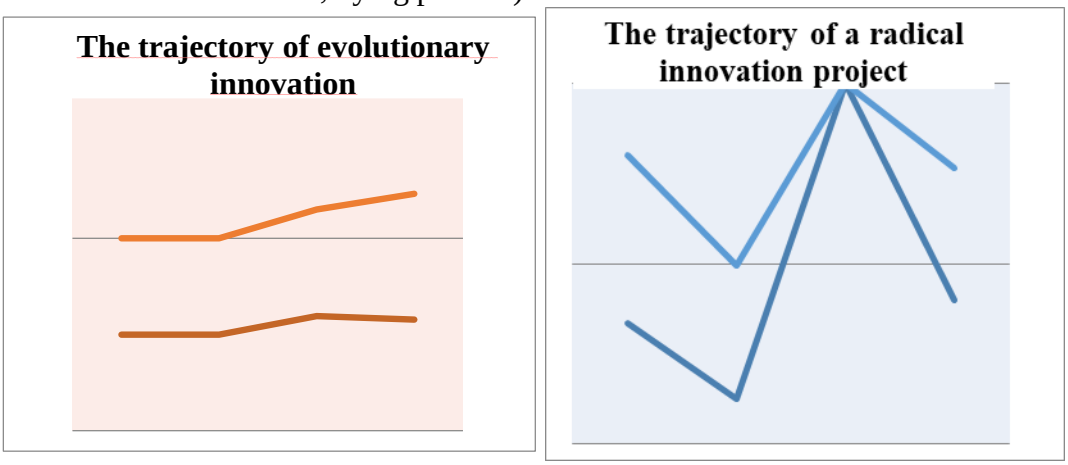


Figure 1-Trajectory of evolutionary and radical innovation projects

But in modern conditions, it is not enough for enterprises to develop innovative products in order to effectively develop and maintain their own competitiveness, but their implementation in the market is very important.

Commercialization, as defined by V. I. Mukhopad, is the process of turning an object of property (innovation) into profit through trade. E. A. Monastyrny and Ya. N. Grik defined commercialization as income from its sale or use in their own production. J. Kozmetsky characterizes commercialization as a process in which the results of scientific research and development (R & D) are timely changed to products and services on the market.

In other words, commercialization can be represented as the process of bringing innovative products to market. This process involves several consecutive steps.

At the first stage, if a company develops several innovative products, it evaluates and selects the most effective ones to bring to the market. Evaluation is carried out in the form of an expert examination according to certain criteria: the potential of innovative products, the demand for these products in society, the demand for products from a potential buyer (in a certain market segment), the potential economic effect from the sale of products (net present value, internal rate of profitability, payback period, etc.). The second stage of the commercialization process is the formation of the necessary financial resources. Since only a few innovative enterprises have sufficient funds for independent financing of developments, the main task of the enterprise at this stage is to attract an investor. The rights to innovations created at the third stage are assigned with their distribution among all participants in the process.

Thus, the fourth and final stage of commercialization involves organizing the production of an innovation or, if necessary, introducing it into the production process with further improvement.

It should be noted that innovative enterprises are not the only participants in the commercialization process, but in this article commercialization is considered from the point of view of innovative enterprises. Taking into account the proposed principles of commercialization of innovations, the paper examines the problems of commercialization of innovations in higher educational institutions.

Currently, the most serious problems in the innovation sphere are the following:

1. unclear and too broad priorities for conducting applied research, the abundance of scientific organizations aimed at state support, lead to the dispersion of budget funds and limit the possibilities of reproduction at the level of scientific organizations.

2. capitalization of science most often occurs at the level of individuals, which exacerbates the problems of attracting investment in scientific organizations and contributes to the "gray" export of knowledge. Outdated scientific equipment and testing facilities limit the realization of modern human scientific potential and the attractiveness of scientific activities for young specialists.

3. in combination with the insufficient amount of budget funds allocated for scientific research, often estimated funding leads to the preservation of the problem of internal and external outflow of the best scientific personnel, increases the risk of deterioration of domestic science.

Today, innovation activity, along with education and science, is one of the most important tasks of modern universities. The partnership of higher education institutions with industry is based on intellectual property – a particularly valuable intangible asset that is the result of educational, scientific and technical activities of higher education institutions. One of the necessary conditions for the cost-effective use of intellectual property is the availability of an innovative infrastructure that is actively functioning in higher education institutions, especially in the field of technology transfer and intellectual property management.

Systematization of existing approaches allows us to conclude that the subject of commercialization is the creation of "a money generation mechanism, that is, a certain business that generates stable financial flows." Commercialization begins when there is an innovative product or service with new or improved properties that are valuable to consumers. The goal of commercialization of innovations is to make a profit, which means that when an innovative product or service is successfully brought to market, and the profit is obtained, the commercialization process is completed, that is, the revenue from the sale of an innovative product exceeds the cost of its production and sale. "The commercial implementation associated with innovation acts as a potential factor that requires certain efforts." In modern conditions, commercialization of innovations is carried out in three main forms: sale of an innovative technology or license to use the production of an innovative product or service (conclusion of a license agreement); direct introduction of innovations into production (the process of providing services) by, for example, implementing an innovative project, creating a small enterprise, etc.; assistance in the development of innovative technology or production of innovative products (services) through the provision of services, including Engineering, Consulting, expert and other services. Taking into account the structure of the market supply of modern universities, it is possible to use all the listed niches of commercialization in the field of higher professional education.

In general, the commercialization of innovations involves solving the following tasks: creating new markets by forming the consumer value of innovations for them; creating an imperative for customer-oriented companies and adapting to changing market conditions; using marketing support for the process of commercialization of innovations. Commercialization of innovative products and services, including in the field of higher professional education, is associated with certain technological, structural, organizational, legal and financial difficulties. Most of the problems faced by innovative enterprises and organizations are caused by the lack of a systematic approach and insufficient attention to the problems of innovation marketing.

Successful commercialization of innovations in higher professional education can benefit from efforts in the following areas:

-at the national and regional levels: state support for high-tech research centers; creation of innovative platforms for technology transfer at the regional level, centers for commercialization of innovations;

-at the micro level: informatization of all processes that accompany the development and implementation of innovations; social popularization of innovations in order to increase demand for innovative products, services and technologies; cooperation of educational institutions, research institutes and industrial enterprises.

In Kazakhstan, venture financing of the most advanced innovations with selective support of projects is currently at the initial stage of development. Favorable conditions for venture capital funds are not yet fully formed. Therefore, many successful funds are registered in other countries (under the so-called" offshore jurisdiction " scheme) and commercialize Kazakhstan's technologies abroad. Funds operating in Kazakhstan do not fully realize their potential due to the imperfection of Kazakhstan's legislation. Participation of budgetary funds in a venture fund requires its registration under Kazakhstan law. At the same time, the conditions and nature of venture capital formation require a different organizational and legal form that allows attracting foreign funds for venture financing of Kazakhstan's scientific research. 95% of venture funds created in Kazakhstan and operating in the field of intellectual property commercialization are registered in offshore zones of other countries. Unlike European practice, Kazakhstan does not have legislation on the state's right to participate in such venture funds. Recently, industry funds with state participation have started to appear in Kazakhstan, but they have not yet become active participants in the national innovation system.

Antonio Hidalgo and Jose Albor proposed the use of typologies as an innovation management tool. The study conducted at a European level used 10 typologies for knowledge-driven Innovation Management Tools. These typologies were found by looking at 32 characteristicsthat classify Innovation Management Tools. Hidalgo and Albors were able to narrow the list down to 8 criteria (knowledge-driven focus, strategic impact, degree of availability, level of documentation, practical usefulness, age of the IMT, required resources for implementation, measurability), that are especially relevant for IMTs in the knowledge-driven economy (knowledge economy). The advantage of using typologies is the easy integration of new methods and the availability of a broader scope of tools.

| **IMT typologies** | **methodologies and tools** |
|---|---|
| Knowledge management tools | knowledge audit, knowledge mapping, document management, intellectual property rights management |
| Market intelligence techniques | technology watch / search, patent analysis, business intelligence, CRM, geo-marketing |
| Cooperative and networking tools | groupware, teambuilding, supply chain management, industrial clustering, |
| Human resources management techniques | teleworking, corporate intranet, online recruitment, e-learning, competence management, flat organization |
| Interface management approaches | research and development - marketing interface management, concurrent engineering |
| Creativity development techniques | brainstorming, lateral thinking, TRIZ, S.C.A.M.P.E.R method, mind mapping |
| Process improvement techniques | benchmarking, workflow, business process re-engineering, Just-in-Time |
| Innovation project management techniques | project management, project appraisal, project portfolio management |
| Design and product development management tools | computer-aided design, rapid prototyping, usability approaches, quality function deployment, value analysis |
| Business creation tools | business simulation, business plan, spin-off from research to market |

Thus,innovation is often a technological change that outperforms a previous practice. To lead or sustain with innovations, managers need to concentrate heavily on the innovation network, which requires deep understanding of the complexity of innovation. Collaboration is an important source of innovation. Innovations are increasingly brought to the market by networks of organizations, selected according to their comparative advantages, and operating in a coordinated manner.

When a technology goes through a major transformation phase and yields a successful innovation, it becomes a great learning experience, not only for the parent industry but other industries as well. Big innovations are generally the outcome of intra- and interdisciplinary networking among technological sectors, along with combination of implicit and explicit knowledge. Networking is required, but network integration is the key to success for complex innovation. Social economic zones, technology corridors, free trade agreements, and technology clusters are some of the ways to encourage organizational networking and cross-functional innovations.

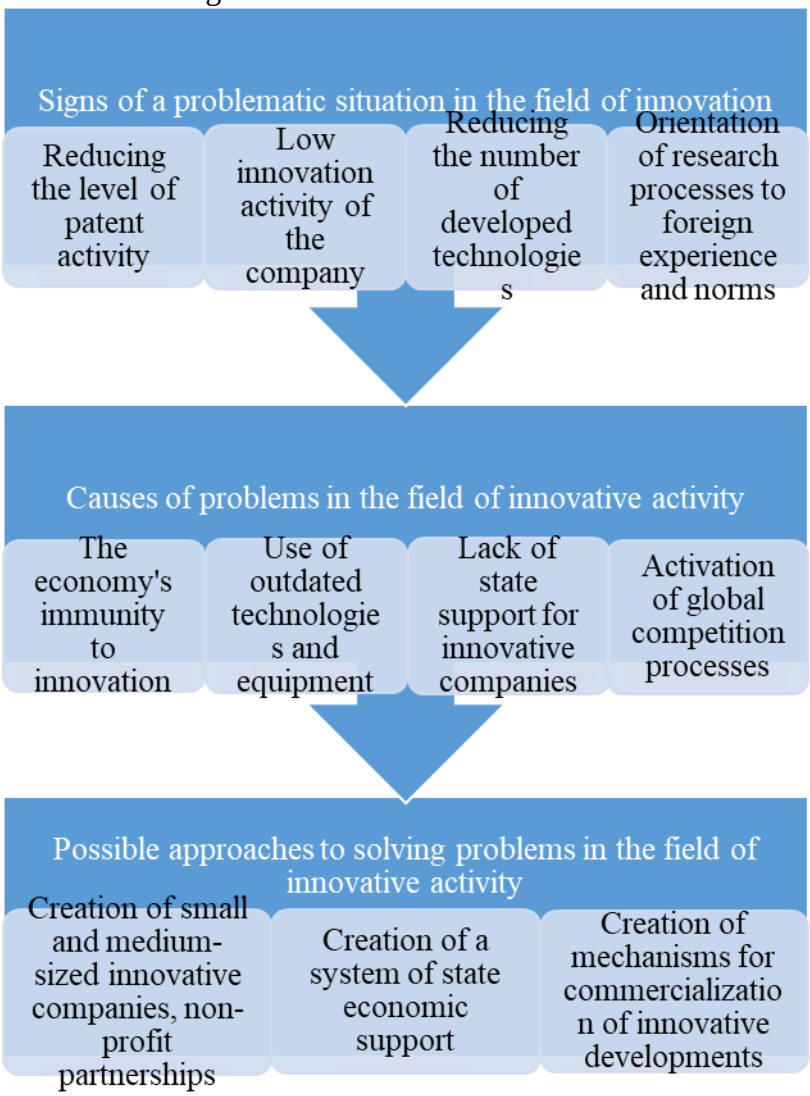


Figure 2 - Signs, causes and methods of solving problems in the process of innovation development

Efficient distribution of financial resources between projects and their performers provides for a consistent and fair distribution of expected revenues between the customer, performer and consumer. There are a number of approaches to creating mechanisms for consistent distribution of expected revenues: distribution on a weighted basis, taking into account the intellectual level of labor costs of project participants, on the basis of consistent profitability, etc. Taking into account the realities of the current market economy and the experience of developed countries, their improvement can become the

basis for creating effective mechanisms. Such a two-stage mechanism will significantly improve the quality of preparation and implementation of innovative projects.

The analysis of conditions and prospects for commercialization of scientific research results shows the need for the state to take drastic practical measures to develop effective mechanisms for financing the innovation system based on approaches that stimulate, support, develop and stimulate innovation activity.

Speaking about the global trends in the development of innovation activities that determine the process of commercialization of innovations, we should highlight:

-stimulating participants in innovation activities and increasing the level of assessment of human resources in the innovation sphere. On the one hand, a set of intellectual assets of the employees ' knowledge, their creativity, problem-solving ability, leadership qualities, management skills object of business is to create and values, as for example in the form of outsourcing can be an object of commercialization, and on the other hand, the outflow of capital in the innovation sphere of the intellectual part of the work not only loss of businesses, companies, as well as significant costs when changing a specialist can mean the emergence of competitors;

-increasing the level of activity of patent and information research. The basis for determining the external conditions for the commercialization of innovations are the developments carried out in the process of creating innovations, collecting, processing, and analyzing information about consumers, competitors, and markets, taking into account patent and information research;

-introduction of internal technological audit on a systematic basis at innovative enterprises.

Such a technological audit, which consists of analyzing the knowledge, experience, and other intangible assets available to the enterprise and its individual divisions, determines the internal opportunities for commercialization of innovations.

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