THE CHOICE OF PUBLIC-PRIVATE PARTNERSHIP IN INNOVATION

Abstract. At present, in the condition of the turbulence of the world economic system, the state's ability to create and use innovations is a necessary condition for ensuring high-quality economic growth and competitiveness. The achievement of this condition requires radical changes in the innovation environment based on regularly conducted innovation and technological forecasts, the use of new mechanisms for managing the national innovation system. The purpose of this study is to develop a methodology for decision-making in the negotiations for the selection of a specific model public-private partnership, acceptable to all its parties and is most preferable for the external and internal environment in which innovative activity is realized. In connection with these provisions, the article examines the main directions of the public-private partnership strategy in the innovation sphere, as well as the necessary conditions for interaction between the state and business in the implementation of major investment projects in the innovation sphere. The main stages of the formation of public-private partnership in the Republic of Kazakhstan are presented. In particular, mechanisms for financing innovative projects within the framework of public-private partnership were considered. An attempt was made to develop a methodology for decision-making in the negotiations on the choice of a specific model of public-private partnership in the implementation of innovation through the theory of games.

Keywords: public-private partnership, innovation, game theory, financing innovation.

Introduction. The creation of unique competitive advantages in the face of growing competition in the world market is becoming increasingly relevant for domestic enterprises. The experience of the advanced economies shows that the creation of such advantages directly depends on the possibility of implementing innovative activities in the country. Innovative, in this case, means activities (including scientific, technological, organizational, financial and commercial) aimed at implementing innovative projects, as well as creating an innovative infrastructure and ensuring its functioning [6].

Proceeding from this, at the present stage of development of the Kazakh economy one of the main tasks is the transition to an innovative development model. In his message to the people of Kazakhstan dated January 31, 2017, "The third modernization of Kazakhstan: global competitiveness" is mentioned by the President of the country N.A. Nazarbayev in the second priority is a cardinal improvement and expansion of the business environment, where he talks about the need to transfer a number of state services to business through PPP, which reveals a great potential for the development of entrepreneurship [12].

The study of forms and mechanisms of PPP in innovation activity for the Republic of Kazakhstan is one of the topical issues for research. Since the world practice has shown that if we consider innovation as a kind of economic activity it can be confidently asserted that it needs support and funding from both the state and the private sector, which in turn positively influences the further commercialization of innovative products.

The purpose of this study is to develop a methodology for decision-making in the negotiations for the selection of a specific model public-private partnership, acceptable to all its parties and is most preferable for the external and internal environment in which innovative activity is realized.
Literature review. The theoretical foundations of PPP are developed in the works of such foreign authors (including those from CIS countries), such as Bovis C.H., Cruz N.F., Simoes P., Marques R.C., Bochkov S.O., Varnavsky V.G., Hamilton J., Deryabin M.A., Jiang Feng, Avvakumov A.A., Zanoga D., Kurapov G.P., Yasheva G.A., Kolganov N.M., Larin S.N., Markov I.N., Noskov V.N., Simonov B.P. and others. In the Republic of Kazakhstan, very few scientists study the methodology of public-private partnership relations, among which we can mention Mataev T.M., Te A.L., Beisembinova A.S., Zhangirova R. and others. Taking into account the urgency and insufficient degree of development of the mechanisms of public-private partnership in the innovation sphere, the goal of this article was to search for the optimal model of public-private partnership in the innovative development of Kazakhstan economy [2, 10, 16, 17].

Such a weak scientific justification and theoretical study of PPP in Kazakhstan is because this type of cooperation between the state and the private sector is a new direction, and it is at the root of its formation and development. In the table below the chronology of the development of cooperation between the state and business within the framework of PPP is presented.

**Table 1 - History of cooperation between the state and the private sector in Kazakhstan**

<table>
<thead>
<tr>
<th>Period</th>
<th>Highlight</th>
<th>Feature</th>
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<tr>
<td>early 90's</td>
<td>For the first time, the application of new mechanisms for cooperation between the state and the private sector</td>
<td>State participation in the authorized capitals of legal entities along with the private sector, trust management of state-owned objects, state purchases, privatization. PPP was considered mainly as an element of state assets management.</td>
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<td>23 December 1991 year</td>
<td>The First Law of the Republic of Kazakhstan &quot;On Concessions&quot; [9]</td>
<td>The conditions for granting state property, land, and natural resources to a foreign investor are determined. Regulation of organizational, economic and legal conditions for granting facilities in concession only to foreign investors on the territory of the Republic of Kazakhstan</td>
</tr>
<tr>
<td>7 June 2006 year</td>
<td>New Law of the Republic of Kazakhstan &quot;On Concessions&quot; [13]</td>
<td>Legal conditions for the concession, types of state support for the concessionaire and regulation of public relations in the process of concluding, executing and terminating concession contracts are determined.</td>
</tr>
<tr>
<td>2008 year</td>
<td>Established JSC &quot;Kazakhstan Center for Public-Private Partnerships&quot;</td>
<td>Functions: economic assessments of projects, work to improve the legislative field and strategic development of the PPP system in Kazakhstan</td>
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<tr>
<td>2011 year</td>
<td>The Program on PPP Development in the Republic of Kazakhstan for 2011-2015 was adopted [14]</td>
<td>Objective: to ensure the implementation of a set of measures to enhance the role and significance of PPP mechanisms</td>
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<tr>
<td>2013-2014 years</td>
<td>Regional PPP Centers have been established</td>
<td>Maintenance of regional PPP projects</td>
</tr>
<tr>
<td>2014 year</td>
<td>The Center for Support of PPP Projects was created</td>
<td>It carries out work at the stages of project preparation, structuring, negotiating among project participants, and developing proposals on the structure of financing of potential PPP projects</td>
</tr>
<tr>
<td>2015 year</td>
<td>The Law of the Republic of Kazakhstan &quot;On Public-Private Partnership&quot; was adopted [8]</td>
<td>It provides for the removal of restrictions on the scope of PPP application, expands the subject composition of PPP participants, increases the role of the private sector in initiating and preparing PPP projects</td>
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Note: this table was compiled by the author on the basis of [8, 9, 13, 14] literature.

The PPP model in the innovation sphere is a concrete PPP project that arose because of a legitimate and transparent procedure for selecting relevant PPP participants from the private business to solve specific problems in the innovation sphere and aimed at solving particular problems of the innovation policy of the Republic of Kazakhstan.
Within the framework of each type, several models can be identified, for example the type of PPP - cooperation in the transfer of technologies can include the following models (projects): the project of creating an innovation and technology center, the project of creating a regional venture fund with state participation, the project of creating a high-tech innovative product.

Public-private partnership in the stages of the innovation process (education, R & D, investment, transfer of innovation) is as follows. Knowledge is a source of innovation both in the product itself, and in production technology, management, marketing methods, advertising, etc. Partnership in education is implemented in such areas: participation of state regional bodies in the development of educational programs in local universities; organization of training seminars, conferences on management, marketing, law and logistics for business entities of a particular region.

Areas of cooperation in research and development are: joint (engineers of state research organizations and business structures) performing research; joint design and development of products; improvement of product design; improvement of production methods; joint development of high-tech goods. Collaboration in investment activities consists in joint financing of innovation projects by business entities and state and regional government bodies, attraction of foreign capital by regional government bodies for the creation of enterprises with foreign investment, creation of venture funds. Cooperation in the transfer of technology is the creation of technology transfer centers, free economic zones, technology parks, business incubators and the creation of joint and franchising organizations.

Thus, the activation of innovation activity because of public-private partnership takes place at all stages of the innovation process. Factors of innovative activity are: knowledge sharing, ideas generation, co-financing of research and development. The partnership between the state and business requires the coordination of the interests of these two main institutions of modern society and the economy. PPP does not mean a simple addition of resources. Each of the parties to the partnership has its own goals, solves its specific tasks, the parties have different motivations.

In the Republic of Kazakhstan, as part of the public-private partnership in the implementation of innovative activities are:

- a state whose interests are represented by republican, regional and local authorities;
- a private partner, which is, as a rule, a legal entity or an individual that conducts various types of economic activities aimed at making profit;
- a scientific organization capable of "generating" innovations, which is usually a higher education institution, a research institute or a laboratory. The purpose of this study is to develop a decision-making technique in the negotiations on the selection of a specific model of public-private partnership, acceptable to all its parties and most preferable for the external and internal environment in which innovative activity is realized.

To successfully use the mechanisms of public-private partnership in the innovative development of the economy of the Republic of Kazakhstan, a state strategy for the development of public-private partnership in the Republic of Kazakhstan is needed as part of the state innovation strategy.

Table 2 - The main directions of the strategy of public-private partnership in the innovation sphere:

<table>
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<th>№</th>
<th>Main directions</th>
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<td>1.</td>
<td>development and constant updating of scientific and innovation policy;</td>
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<td>2.</td>
<td>Combining state and private property within the framework of significant innovative projects on the principles of profitability and repayment;</td>
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<td>3.</td>
<td>Promoting, promoting and disseminating knowledge about PPPs;</td>
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<td>4.</td>
<td>Creation of the legislative base for scientific and innovation activities, taking into account strategic goals, priorities and policies in this area;</td>
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<td>5.</td>
<td>Development of PPP development programs in selected sectors of the economy;</td>
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<td>6.</td>
<td>Carrying out activities to increase trust between partners and developing a culture of cooperation between public and private partners;</td>
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<td>7.</td>
<td>Development of forms and methods of interaction between public authorities, public and private scientific and innovative institutional units;</td>
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<td>8.</td>
<td>Improvement of tax and customs policy, including tax and customs privileges;</td>
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<td>9.</td>
<td>Assistance and partnership in the formation of the scientific and innovation infrastructure (technology centers, technology parks, centers for collective use of equipment, sectoral centers for technology transfer, FEZ, etc.);</td>
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<td>10.</td>
<td>International cooperation (for example, the creation of innovative joint corporations);</td>
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<td>11.</td>
<td>Financing by the state of the development of venture funds, a network of business angels, start-up schools;</td>
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<td>12.</td>
<td>State support of small and medium-sized businesses in the innovation sphere;</td>
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<tr>
<td>13.</td>
<td>Formation of elements of the institutional environment of PPPs in the country: financial and economic institutions that provide investment and guarantee of private investments, independent organizations that carry out project and consulting expertise, management companies, associations, associations, funds, etc.;</td>
</tr>
<tr>
<td>14.</td>
<td>Training of specialists in the field of PPP and cadres of investment managers;</td>
</tr>
<tr>
<td>15.</td>
<td>Definition of financial relations between public authorities, state and private scientific and innovative organizations.</td>
</tr>
</tbody>
</table>

Note: Source [4]

The totality of these measures should facilitate the accelerated development of a competitive innovation system in the Republic of Kazakhstan, and, consequently, accelerate the modernization of the economy at the national level. The solution of these tasks will undoubtedly require both a state and business approach to a creative, entrepreneurial approach based on the search and implementation of innovations, not only in the sphere of production, but also in the management and organization of investment design.

The interaction of the state and business in the implementation of major investment projects in the innovation sphere requires the fulfillment of a number of necessary conditions. These include:

- Presence of clearly defined state strategic priorities and identification of possible ways of achieving them through individual local projects;
- Establishment of rules for interaction between the state and private business in the implementation of joint projects;
- Development of specific proposals on the division of investments, risks and benefits for each project under implementation.

The main stages of PPP formation in Kazakhstan are the following (Picture 1):

![Picture 1 - Proposed main stages of PPP formation in Kazakhstan](image)

Note: developed on the basis of [4]

The draft agreement on public-private partnership in the innovation sphere may include the following provisions:

1) The subject and object of the agreement;
2) Purpose of the agreement;
3) The term of the agreement;
4) Scope, content and types of work and (or) services;
5) Terms of performance of types of work and (or) provision of services;
6) The procedure for the establishment (construction, reconstruction) and / or operation of the object of the agreement;
7) Powers, rights and obligations of the parties to the agreement;
8) Financial terms of the agreement, including the procedure for settlements between the parties;
9) Distribution of risks;
10) Guarantees provided to parties to the agreement;  
11) The totality of rights that the public partner transfers to a private partner;  
12) Resources of the state partner, transferred by each state partner to the private partner, the order of transfer of these resources;  
13) Ownership of the object of the agreement, as well as intangible assets associated with the agreement (licenses, permits and other documentation), the distribution of the shares of the public and private partners in the ownership right to the specified object, the conditions and the moment of the emergence of such rights;  
14) The procedure for the return of the resources of the state partner and the property newly created as a result of the implementation of the agreement, necessary for the further provision of services, at the time of expiry of the term or in case of early termination of the agreement;  
15) Environmental, historical and cultural requirements and safety requirements;  
16) Insurance conditions in connection with the implementation of the agreement.

Considering the theoretical basis of PPP, it is necessary to note the basic mechanisms of financing innovative projects within the framework of public-private partnership. Among the models of financing innovative PPP projects are such as commercial hiring, renting, all types of leasing, project financing.

Project financing is the system of the investment process, where the initiator and (or) the project sponsor of the financial and other resources or credit a project in which the source of payment is the collateral for lending.

Project financing is usually carried out in the form of loans "with a limited right of recourse", issued to a specially created target project company that has the right to construct and operate the facility within the project. With project financing, the lender carries increased risks, issuing, in terms of traditional bank loans, an unsecured or not fully secured loan. Repayment of this loan is carried out at the expense of cash flows generated during the operation of the object of investment activity.

Participants of project financing in the implementation of PPP projects are (Picture 2):

- The winning company for the right to conclude an agreement;  
- A project company established by a private partner - winner of the competition;  
- Contractors (general contractor, subcontractors);  
- Suppliers of equipment and materials;  
- Buyers of goods and services produced at the site of the agreement;  
- Asset management companies.

- Banks that finance and finance the project;  
- International Financial institutions;  
- Guarantor banks.

- Insurance companies;  
- The republican and Local budgets

- Consultants, Leasing Companies, etc.

Note - Source [4]

Picture 2 - Participants of project financing in the implementation of PPP projects

Sources of project financing are: shares; commercial loans; public funds (in the form of subsidies and loans, as well as guarantees, tax and other benefits); own funds of companies; debt financial liabilities; forfaiting; bonds; leasing; development agencies (World Bank, European Bank for Reconstruction and Development, International Finance Corporation (IFC), mortgage).

The main advantages of project financing are:

- The obligations of the project company are not reflected in the balance sheet of the state partner or shareholders and, therefore, do not affect their credit attractiveness;
When using project financing, some of the risks are shifted to creditors in exchange for obtaining a higher margin than for ordinary corporate loans;
- Project financing provides a more favorable average cost of capital compared to net financing from own funds;
- Project financing facilitates the use of a more transparent risk-sharing mechanism and creates incentives for improving the quality of work of all project participants and effective risk management;
- The purpose of financing;
- Guarantees of member states of financial institutions;
- High degree of control;
- Extensive attraction of foreign investments.

**Materials and methods.** To reveal the content and achieve the goal in this paper, the following methods of scientific knowledge were used: mathematical, analytical, expert, meta-analysis and meta-synthesis. Thanks to this, we were able to find the main directions of the public-private partnership strategy in the innovation sphere, mechanisms for financing innovative projects within the framework of public-private partnership and the possibility of defining a PPP model using the theory of games.

A concrete model of public-private partnership can be formed only after negotiations between the parties to the partnership. This is due to the fact that persons who decide to participate in public-private partnership, depending on the interests of which partner they operate, will be considered the most preferable for specific conditions of the external and internal environment in which innovative activity is realized, various models of state-participation partnership. If we assume that, the most preferable model for the person taking the decision to participate in the partnership and acting in the interests of the state is the transfer of the entire amount of the subsidy to a higher educational institution for R & D. At the same time, for the person making the decision to participate in the partnership and acting in the interests of the private partner, the model most likely will be the one that involves transferring only 20% of the subsidy to a higher educational institution.

It is obvious that in this case it is necessary to solve the problem of negotiations between the parties of public-private partnerships jointly involved in the implementation of innovative activities. In search of a solution to this problem, it is reasonable to rely on the theoretical provisions of the "game theory" - one of the branches of applied mathematics.

The problem of negotiations (or the problem of transactions) is considered in game theory as a two-person game in which the situation of bilateral negotiations is modeled. It involves two players (two parties to the negotiations) that decide on the distribution of a certain good among themselves. If players agree on a distribution, they get the required part. Otherwise, no one gets anything [3].

In this paper, it is possible to use the type of game solutions (business situation), called the "Nash decision", when negotiating the choice of a specific model of public-private partnership in the implementation of innovation activities.

In the case of negotiations on the choice of the model of public-private partnership in the implementation of innovative activity, the negotiating situation (transaction) is formally written in the form of a mathematical expression \{X, d, u1, u2\}, where:

- X - set of alternative signs and values of these signs in the model of public-private partnership, of which the participants in the negotiations are selected;
- u1 - the function of the i-element correspondence to the conditions for the implementation of innovation activity from the point of view of the person making the decision to participate in the partnership, determined on the set of values of X;
- dX is the point of disagreement (the outcome that participants will receive if negotiations fail) - the model of public-private partnership will not be accepted for implementation.

**Results and discussion.** The review of foreign experience of financial provision of PPP [7, 5, 1, 15] allowed to determine the main forms of state support for PPP projects aimed at increasing their efficiency, acceptable for the Republic of Kazakhstan:

1) Provision of benefits for real estate tax for the payback period of the investment project in terms of crediting to the local budget (but not more than 5 years);
2) Exemption from income tax for the period of the concession (tax holidays);
3) Granting of privileges on land tax in the course of construction during the implementation of the investment project by the entities;
4) Provision of income tax relief for foreign investors (participants in the PPP project);
5) Exemption from income tax of foreign workers working on the project / creditors;
6) Exemption or reduction of customs duties on imports of equipment, raw materials and building materials;
7) Tax refund to foreign investors, reinvesting their profits in the new projects aimed at developing infrastructure in the country implementing the main concession agreement;
8) Provision of interest-free or low interest rates for loans (loans) in order to reduce the total cost of financing the project;
9) State guarantees from the main contractor or other government agencies on repayment of debts on loans (loans);
10) Provision of tariff subsidies to the company in the event that the revenues from the project are reduced to a certain minimum level;
11) A permit issued to the company on the project, to cross-subsidize the least profitable activities.

As a rule, when choosing the model of public-private partnership in the implementation of innovative activities, all participants in the negotiations conduct an evaluation of the constituent elements of it. Persons taking decisions on participation in the partnership, acting in the interests of various parties to the partnership. Further, in the course of negotiations, the parties use various methods to bring the assessments closer together. At this stage of the negotiations, there are usually disagreements between the parties, each of which seeks to insist on the use of a more preferable component of the public-private partnership model for it, i.e. its specific sign or the specific meaning of this feature.

"Nash solution" of the transaction problem is an axiomatic principle of optimality that satisfies the following axioms:

1) the invariance under affine transformations of the functions of the correspondence of the i-th element to the conditions for the implementation of innovation activity from the point of view of the person making the decision to participate in the partnership;
2) Pareto efficiency, i.e. a state of the system in which the value of each particular criterion describing the state of the system cannot be improved without impairing the position of the other elements;
3) Independence from extraneous alternatives: if the deliberately non-optimal alternatives are removed from the set X, then the solution of the problem will not change;
4) Symmetry, implying that if the players are the same, that is, u1 = u2, if the odds are the same, u1 (d) = u2 (d) and the set X is symmetric, that is, for any alternative x'εX there is an alternative x"εX such that if u1 (x') = u2 (x"), u1 (x") = u2 (x'), then u1 (x) = u2 (x).

The solution of the problem of negotiations {X, d, u1, u2} satisfying axioms - (4) is the maximum point on the set X of the function F (x) = (u1 (x) - u1 (d)) (u2 (x) - u2 (d)) [11].

The formal situation, reflecting the process of negotiating an acceptable partnership for all parties, assessing the constituent elements of the public-private partnership model in implementing innovation activity and choosing a specific model that partners are ready to implement in practice, as a rule, satisfies the axioms - (4). This testifies to the principle possibility of applying the "Nash decision" to choose a model of public-private partnership acceptable for all parties in the implementation of innovation activities.

Conclusion. To ensure the innovative development of Kazakhstan, it is necessary to formulate and approve a strategy for public-private partnership and mechanisms for its implementation.

Developed and presented in this article, the theoretical and methodological foundations of using a new resource of innovative economic development - public-private partnerships of business, government and education will allow obtaining a synergistic effect from cooperation. The growth of innovation activity because of public-private partnership takes place at all stages of the innovation process: education, R&D, investment, transfer of innovations. Factors of innovative activity are: knowledge sharing, ideas generation, co-financing of research and development.

The use of the proposed mechanisms for financing public-private partnerships will allow businesses to obtain additional sources of financing for innovation and to activate innovative activities. The effect for
the state as a second partner will be to increase the innovation potential of regions and the country as a whole, improve macroeconomic indicators, and increase regional and national competitiveness. The proposed directions for the formation of a public-private partnership strategy in Kazakhstan and the financial mechanism for its implementation will be of interest both for representatives of business, business unions, and for state and regional government bodies.

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ИННОВАЦИОННЫЙ КУРС МЕМЛЕКЕТКІК-ЖЕКЕ МЕНШІК СЕРІКТІСТЕПІНІҢ УЛГІСІН ТАНДАУ

Аннотация. Қазақстан танда әлдемді экономика құйысының тұрбалықтығы қандайында мемлекеттің инновацияларды жасау же де оларды тәжірибе құжатында қолдану білу кәбілеті сапалы экономикалық әсұ мен боскесе кәбілеттілікі әр тұрғылда және өз басқармасы қызметін, әр тұрғылда өз кәбілеттілікін іздейді. Қазақстандың және әлдемді экономикалық статусына қарай, мемлекеттің инновациялық құмдылығына ықпал етеді. Қазақстандағы инновациялық құмдылық сапалы экономикалық және социалдық қызметтер мен басқармаларының қамтылуында ақысын әр тұрғылда құмдылық құмдылыққа қарай. Мемлекеттің инновациялық құмдылығына қарай, мемлекеттің инновациялық құмдылығына қарай, мемлекеттің инновациялық құмдылығына қарай. Мемлекеттің инновациялық құмдылығына қарай, мемлекеттің инновациялық құмдылығына қарай, мемлекеттің инновациялық құмдылыққа қарай.

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Аннотация. В настоящее время в условиях турбулентности мировой экономической системы способность государства к созданию и практическому использованию инноваций становится необходимым условием обеспечения качественного экономического роста и конкурентоспособности. Достижение такого условия требует кардинальных преобразований в инновационной среде на основе регулярно проводимых инновационно-технологических прогнозов, использования новых механизмов управления национальной инновационной системой. Целью этого исследования является разработка методики принятия решений на переговорах по выбору конкретной модели государственно-частного партнерства, приемлемой для всех его сторон и наиболее предпочитительной для внешней и внутренней среды, в которой реализуется инновационная деятельность. В связи с данными положениями в статье рассматриваются основные направления стратегии государственно-частного партнерства в инновационной сфере, а также необходимые условия для взаимодействия государства и бизнеса в реализации крупных инвестиционных проектов в инновационной сфере. Представлены основные этапы формирования государственно-частного партнерства в Республике Казахстан. В частности, были рассмотрены механизмы финансирования инновационных проектов в рамках государственно-частного партнерства. Сделана попытка разработки методологии принятия решений на переговорах о выборе конкретной модели государственно-частного партнерства в осуществлении инновационной деятельности с помощью теории игр.

Ключевые слова: государственно-частное партнерство, инновации, теория игр, финансирование инноваций.

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