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PECULIARITIES OF THE METHODOLOGIES FOR MANAGING PROJECTS AND PROGRAMMES TO ENSURE THE INNOVATION PROCESS

At the stage of market transformations in Ukraine, the possibilities for increasing the output of products and services by attracting new resources to the economic turnover become limited. The transition of the economy to the innovative type of economic growth is crucial for economic dynamics. The **subject matter** of the study is the process of implementing innovations from the innovation infrastructure perspective within the project methodology. The **goal** of the study is to create the concept of an effective system for servicing the innovation process, taking into account the specifics of implementing the project management methodology. The objectives of the study are to analyze the features of the innovation infrastructure; to consider ways to finance the stages of the innovation process from the project methodology perspective; to consider the possibility of using foresight within project methodologies; to formulate the task of making decisions on the assessment of the innovative potential of the region. The **methods** of the study included logical generalization, analysis and synthesis, structural analysis. The following **results** were obtained: the basic elements of the innovation infrastructure as the system of organizational and economic forms and institutional structures were developed and described; the elements of the innovation infrastructure were classified according to different forums. The differentiated approach to financing the stages of the innovation process for various project methodologies (project, programme and portfolio) were suggested for using; the use of foresight for implementing the innovative approach was rationalized, namely as the technology for long-term forecasting; the diagram for coupling the foresight methodology and the project methodology of values creation was constructed; the elements of the decision-making task of assessing the innovative potential of a region built by using the methodology of the programme approach were formalized; this approach can be used by regional and state authorities to assess the degree of impact of one or another factor on the innovative potential of a territory as well as to determine the priority directions of innovative development. **Conclusions.** Considering the methodology of programme management in the context of foresight, the main results from the implementation of this methodology in production can be seen, and, what is the most important, the use of the foresight methodology takes an enterprise immediately to the fourth level of technological maturity out of the five ones. That means that using the above methodologies, innovations can be developed and implemented. Moreover, maximal benefits of the introduced innovation can be predicted.

Keywords: innovations, innovative economy, project methodology, project management, programme management, foresight.

Introduction

At the stage of market transformations in Ukraine, the possibility of increasing the output of products and services by attracting new resources into the economic turnover becomes more limited. The transition of the economy to the innovative type of economic growth is crucial for economic dynamics.

Innovations are becoming the main "actor" of the theoretical scenarios and the practical implementation of the modern scientific and technological revolution, pushing aside conventional investments that have long been the main factor of the economic growth. So far, economic theories that deal with the expanded reproduction have considered the increase in the volume of capital investments as the main condition of scientific and technological progress in particular, and economic development in general. Theoretical studies have paid insufficient attention to market-oriented innovations. The fundamental increase in the role of innovation is primarily due to the changes in market situation: the nature of competition, the transition from the usual "static" to "dynamic" competition. This fact has largely determined the peculiarities of the interaction of innovations and the market at the present stage [1, 2].

In Ukraine, there are objective prerequisites for developing the innovative economy. Ukraine can

rapidly exit from the crisis by realizing the benefits of the innovative economy which should be supported by active state policy. Creating an economic mechanism that enables generating, reproducing and using scientific and technological innovations in order to increase the pace of economic development and quality of life in our country is becoming extremely crucial. This task can be solved only by the adequate understanding of the main characteristics of the innovative processes, their driving forces and patterns. The implementation of a new innovative economy should result in the achievement of a high level of social orientation of scientific and technological progress, in the increase of the standard of living of the population due to the growth of the efficiency of social production, in the qualitatively new level of resource conservation and ecologization of the economy. Innovative transformations in recent decades have provided accelerated development of the world economy. The contribution of scientific achievements to the GDP growth of individual countries exceeds 50%. The study of such economic theories and directions as neoclassicism, Keynesianism, post-Keynesianism, the institutional and sociological direction, neo-institutionalism and others enable defining the factor of improving the "technical conditions" as the main reason for expanding volumes and reducing costs of social production as well as increasing profits. There is a clear

relationship between innovative achievements and the pace of economic growth; the development of the economic system is directly related to the renewed nature of the innovation process; the state innovation policy plays a decisive role in the development of the innovative model of state development [3]. Scientific and technological progress leads to overcoming social contradictions and is a means to ensure a steady improvement in the quality of life. According to the theories of the post-industrial and information societies, the economic development of the state is mostly determined by the complex and timely transformations of the “technostructure”, especially the informational one as evidenced, for example, by the US experience, where the share of information technologies in GDP is 10%. According to experts, in the United States, 1\$ invested in R & D gives 9\$ of the GDP growth.

The analysis of recent studies and publications.

Innovations have become the most important factor of competitiveness and accelerated economic development of not only individual organizations but also states. New features and forms of organization of the innovative process (new mechanisms and institutes of the interaction of segments of the national innovation system (NIS) have appeared as the result of the impact of external global factors. The intensification of innovation requires the appropriate development of innovative and organizational structures.

Under crisis, innovative activity requires significant funding and at the same time is rather risky and therefore, it needs state regulation in the context of the crisis economy. The system of incentives for the recovery of innovative activity should be based on the individual priorities of innovation development. Some attempts to prioritize innovative activities from the state incentives perspective have already been carried out but they, on the one hand, do not take into account all the advanced branches of the world science and technology and, on the other hand, on the contrary, cover a wide range of directions that are not realistic in the context of current present limited possibilities of the state in relation to their financial support.

Currently, project management is considered as one of the factors of the globalization of economies and a common language for the development of states, sectors of the economy and social sphere, enterprises and business [4].

At the present stage, the implementation of innovative projects is an objective condition for ensuring the dynamic development of production and, hence, the economy of Ukraine as a whole. Unlike administrative management, which focuses on operations (manufacturing, sales, customer service) that are repeated with increasing productivity, a project is focused on a certain result and has a finite duration. The development of production, significant technological and technical advances, capacity building have led to the increase in project designs and the increase in the number of projects in individual industries, while there does not exist the practice of applying the project approach to managing the innovative component of the state policy.

An innovative project is topical if it corresponds to the tasks of scientific and innovative and social and economic development of an economic entity, cluster, region and country. Accordingly, the project has a state, regional, industry or cluster significance for the entity.

The project methodology is used if its execution involves the implementation of unique projects and programmes aimed at increasing the competitiveness of enterprises in the domestic and foreign markets, the development of innovative and investment activities in the country.

Among the main scientific approaches in the field of project and programme management, the following ones should be singled out: systemic and programme-oriented (V. Glushkov, B. Miller, R. Pospelov, A. Iirikov, D. Cleland and others), the theory of complex system management (Ye. Druzhinin, M. Mesarovich, I. Takahara, N. Moiseev, Yu. Germire, V. Volkovich, V. Mikhilovich), classical theory of project management on the basis of PMBOK standard (V. Voropaev, S. Bushuev, N. Bushueva, I. Belokon, V. Rach, R. Tian, V. Shapiro, I. Mazur, B. Demidov and others), the system of knowledge on managing the innovative projects and programmes of enterprises – P2M (S. Bushuev, N. Bushueva, Hiroshi Tanaka, Shigenobu Ohara).

Also, while planning and managing projects, the methods of the theory of dual system modelling are widely used (D. Pospelov, M. Buslenko, R. Shannon, N. Solomatin, J. Brown, T. Schreiber, M. Augustin, T. Naylor, V. Tomashevsky, A. Fedorovich, A. Prokhorov), the theory of strategic planning and management (I. Ansoff, A. Gradov, A. Vihansky, Z. Rumyantsev, M. Meskon, I. Kononenko), optimization theory (S. Mlyntsev, V. Vasiliev, N. G. De Brein, V. Dekhtyarenko, S. Travkin, A. Larichev, Ye. Petrov), quality management (F. Crosby, V. Deming, D. Dzhuran, Kara Isikava, A. Shukhart, B. Konorev, V. Kharchenko).

In addition, it should be noted that there are two equally important but not equivalent methodologies for project management in complex innovation systems such as portfolio management and programme management. There are often significant differences between the concepts of the programme and the portfolio of projects as it should be kept in mind that all programme projects are aimed at achieving a certain strategic goal, while the portfolio may consist of different projects with different purposes. A programme is often considered as one big project (multi-project or macro-project).

But, unlike a project, a programme does not necessarily have a deadline. In most definitions, a *programme* is referred to as a series of related projects that are coordinated and managed to achieve advantages and such level of management that cannot be achieved while managing them individually. Such a definition of a *programme* means that a programme should create some kind of additional cost [5, 6, 7].

With regard to the project portfolio, one of its definitions is as follows: a portfolio is a set of projects or programmes and other work that are combined to

manage these pieces of work effectively to achieve strategic goals [8, 9].

The goal of the study is to develop the concept of an efficient system of servicing the innovative process taking into consideration the peculiarities of the implementation of the project management methodologies.

To achieve the goal, the following tasks are solved in the article:

- the features of innovation infrastructure are analyzed;
- the ways of financing the stages of the innovation process from the project methodology perspective are considered;
- the possibility of using foresight within project methodologies is considered;
- the task of making decisions for assessing the innovative potential of the region is formulated.

Materials and methods of the study

Considering the innovative infrastructure as a system of organizational and economic forms and institutional structures that should serve the processes of implementing innovations and ensure their implementation in the overall system of the economy, the following picture can be seen (Fig. 1).

The rapid growth in the number of organizations engaged in innovations and innovative processes in the world testify the development of the innovation infrastructure and its scope in the context of globalization.

Today there are about 7,000 scientific and technological incubators and more than 1,500 technology parks that provide innovative processes in the world.

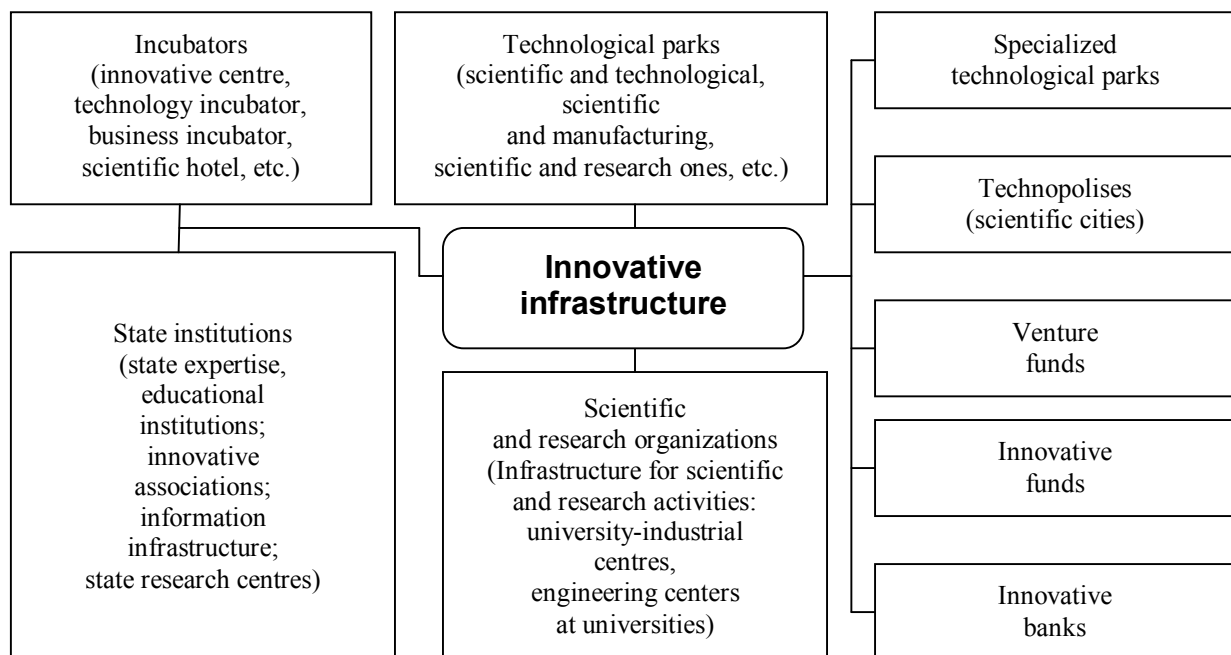


Fig. 1. Basic structural elements of the innovative infrastructure [3]

The study of the features of the components of innovative infrastructure, their advantages and disadvantages, factors affecting the national specificity of the innovation sphere enabled classifying the elements of the innovative infrastructure by the types of ownership:

state (state institutions, expert and information infrastructure, etc.),

mixed (innovative banks, innovative associations, technopolises, venture innovative funds, technoparks, incubators, etc.),

private (innovative centres, venture innovative funds, research centres, consulting firms, etc.);

by the types of integration (incubators and other separate enterprises, park structures, “city-forming” structures, etc.);

by organizational peculiarities (umbrella structures: business incubators, innovative centres, technoparks, etc.; individual organizations: innovative

funds, venture funds, consulting firms, innovative banks, etc.);

by the forms and directions of activities (financing and credit institutions and organizational and economic centres);

by the objects of servicing (servicing only small and medium-sized organizations, only large organizations, servicing all subjects of innovative activity) [3].

As innovations advance from the design to the finished product, both the source of funding and its forms should change.

More details are given in Table 1.

If the differentiated approach to financing the stages of the innovation process is considered within the project methodology perspective, the following can be seen:

at the stage of innovation,

the programme methodology should be used

while at the stage of commercialization, the project methodology should be used and at the stage of implementation of innovations, the portfolio management methodology should be used.

Table 1. The differentiated approach to financing the stages of the innovative process from the project methodology perspective

Stages	Sources (in descending order of importance)	Forms (in ascending order of importance)	Types of project management methodologies
1. the creation of innovations a) fundamental studies b) applied studies	State (through Ministries, departments, special budget funds), extrabudgetary funds, own funds of research organizations; Special extrabudgetary funds, state, venture funds, business environment, own funds of research organizations	Direct financing, grants, financing on a competitive basis Competitive financing, direct financing on the conditions of investments return, preferential crediting	Programme methodology
2. commercialization a) trial production b) mass release	Venture funds, banks and other financial structures, own costs of the enterprise that implement innovations Venture funds, own costs of the enterprise that implement innovations	Venture investments, crediting, intercompany investments Crediting, venture investments, intercompany investments	Project methodology
3. implementation	the own costs of enterprise that implement innovations, business, banks, other financial structures	The money from the sale, credits	Portfolio management methodology

That is, in order to form the innovation infrastructure of a country, two approaches should be used - the programme and portfolio ones. In addition, there are no specific recommendations as for the best branch for using this or that approach, it is up to the performer.

Besides, to introduce an innovation, the method of foresight can be used [10, 11], that is the technology of long-term forecasting, containing three basic principles:

- 1) the future can be created;
- 2) the future is variable, that is, it does not only come from the past but also largely depends on the decisions of stakeholders [12, 13];
- 3) predictions can be built but in general, the future cannot be predicted reliably but probable variants can be predicted and the desired future can be prepared.

Let us detail the connection between foresight and programme methodology since this methodology is used in the first stage of the creation of innovations (Fig. 2).

It can be seen that the main steps of foresight and programme management are rather similar. Attention should be paid to the results which should be obtained when both the mentioned methodologies are used,

namely:

1. Formation of strategic initiatives. The result is obtained when the goal and general strategy of a company are formulated.

Based on this strategy and goal, the main guiding principles for the following activities are highlighted.

In accordance with these principles, the desired combination of projects and programmes in the portfolio is determined, and the degree of associated risk is determined. Standards, budgets, key performance indicators are developed.

2. Implementation of advantages includes the analysis of trends and strategic portfolio.

The tools related to the implementation of advantages ensure the transparency of results, previously detected deviations in the implementation of the programme and the savings from directed efforts and investments in the actions that contribute to creating the maximum effect from the implementation of the programme.

3. The results of the activity are based on the analysis of the development and management of the implementation of the programmes. This section includes almost all tools of the project and programme management.

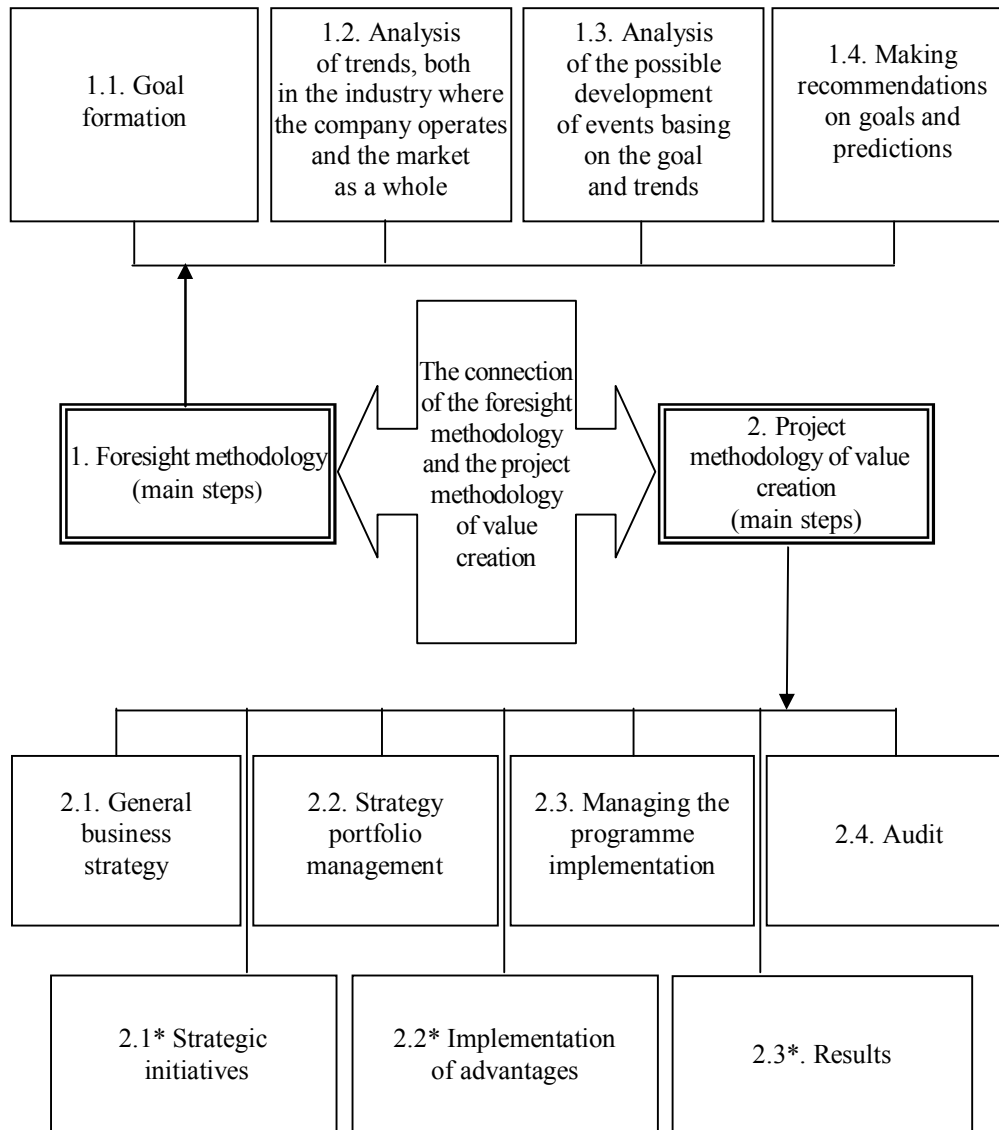


Fig. 2. The connection of the methodology of foresight and the project methodology of values creation

As for the audit, this is a separate issue that requires another study.

It can be seen that the use of programme management methodology on the basis of foresight takes an enterprise immediately to the fourth level of technological maturity [14, 15]

Using the above data, it is possible to formulate the task of making decisions on assessing the level of the innovative potential of the region or the branch where these tools and methodologies will be implemented.

The level of the innovative potential (K_{in}) can be determined by solving the task of making decisions taking into consideration a number of criteria which can be presented as follows:

$$Z(K_{in}) = \langle r, M, K, Y, f, H, s \rangle,$$

where r is a type of constraints (internal or external);

M is a set of solutions;

K is a set of criteria;

Y is a set of rules for criteria selection;

f is the mapping of a set of solutions into a set of vector assessments;

H is the decision-making system of a decision maker;

S is the main decisive rule.

Let us explain the constituents: among the constraints, the limitations associated with the development, realization and implementation of innovations should be determined - they will be different at each stage of the implementation of the innovation; a set of decisions includes all decisions that are related to the innovation; a set of criteria represents, first of all, the dependence of decision-making in the context of the innovation and the level of the technological maturity of the enterprise where the innovation will be implemented while the type of financing does not play any role; a set of rules for selecting criteria is based only within the programme methodology; the main decisive rule corresponds to the goal of the innovation implementation and, depending on the level of the innovation, can be different.

The proposed model of the decision-making task can also be used by regional and state authorities to assess the degree of influence of this or that factor on the state of the innovative potential of the territory as well as on the identification of the priority directions of the innovative development.

Thus, it can be seen that the project management methodology for developing the state innovative infrastructure is worth implementing.

Conclusions

The analysis of the peculiarities of the development of many countries of the world shows that only creating the innovative infrastructure provides:

proper financing of innovative processes,
 creating the competitive environment in the innovative sector of the economy,
 developing and supporting the innovative entrepreneurship,
 stimulating economic subjects for innovation,
 protecting the rights of intellectual property,
 the individual approach to innovative companies and innovative projects of industrial enterprises,
 reproducing the innovation process (innovative conveyor).

It is recommended that the differentiated approach to financing the stages of the innovative

process should be considered from the project methodology perspective:

at the stage of innovation, the programme methodology should be used,

at the stage of commercialization, the project methodology should be used while at the stage of the implementation of innovations,

the portfolio management methodology should be used.

The model of making decision on the assessment of the innovative potential of the region, constructed using the methodology of the programme approach which can be used by regional and state authorities to assess the degree of the influence of this or that factor on the state of the innovation potential of the territory as well as to determine the priority directions of the innovative development was suggested.

Considering the methodology of programme management in the context of foresight, the main results from the implementation of this methodology in production can be seen, and, what is the most important, the use of the foresight methodology takes an enterprise immediately to the fourth level of technological maturity out of the five ones.

That means that using the above methodologies, innovations can be developed and implemented. Moreover, maximal benefits of the introduced innovation can be predicted.

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Received (Надійшла) 21.08.2018
Accepted for publication (Прийнята до друку) 26.09.2018

Особливості методологій управління проектами та програмами для забезпечення інноваційного процесу

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На етапі ринкових перетворень в Україні можливості збільшення випуску продукції і послуг за рахунок залучення в економічний обіг нових ресурсів стають обмеженішими. Вирішального значення для економічної динаміки набуває перехід економіки до інноваційного типу економічного зростання. **Предметом** дослідження у даній роботі є процес реалізації інновацій з точки зору побудови інноваційної інфраструктури у межах проектної методології. **Метою** дослідження є створення концепції ефективної системи обслуговування інноваційного процесу з урахуванням особливостей впровадження методологій управління проектами. **Завдання:** Проаналізувати особливості інноваційної інфраструктури. Розглянути способи фінансування стадій інноваційного процесу з точки зору проектної методології. Розглянути можливість застосування форсайтингу в рамках проектних методологій. Сформулювати задачу прийняття рішень з оцінки інноваційного потенціалу регіону. **Методи** дослідження: логічне узагальнення, аналіз та синтез, структурний аналіз. **Результати:** Сформовано та описано основні елементи інноваційної інфраструктури як системи організаційно-економічних форм та інституціональних структур. Класифіковано елементи інноваційної інфраструктури за різними формами. Запропоновано використовувати диференційований підхід до фінансування стадій інноваційного процесу для різних проектних методологій (проектної, програмної та портфельної). Зроблено висновок про доцільність використання форсайтингу для реалізації інноваційного підходу, саме як технологію довгострокового прогнозування. Сформовано схему зв'язку методології форсайтингу та проектної методології створення цінностей. Формалізовано елементи задачі прийняття рішень з оцінки інноваційного потенціалу регіону, побудовану з використанням методології програмного підходу, що може бути використаним регіональними та державними органами влади для оцінки ступеня впливу того чи іншого чинника на стан інноваційного потенціалу території, а також для визначення пріоритетних напрямів інноваційного розвитку. **Висновки.** Розглядаючи методологію управління програмами крізь призму форсайтингу можна побачити головні результати від впровадження цієї методології на виробництві, і головне, що використання методології форсайтингу переводить підприємство одразу на четвертий з п'яти рівнів технологічної зрілості. Тобто завдяки використанню наведених вище методологій ми можемо не лише розробити та впровадити інновацію, але й спрогнозувати таке майбутнє при якому зиск від впровадженної інновації буде максимальним.

Ключові слова: інновації, інноваційна економіка, проектна методологія, управління проектами, управління програмами, форсайтінг.

Особенности методологий управления проектами и программами для обеспечения инновационного процесса

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На этапе рыночных преобразований в Украине возможности увеличения выпуска продукции и услуг за счет привлечения в экономический оборот новых ресурсов становятся ограниченными. Решающее значение для экономической динамики приобретает переход экономики к инновационному типу экономического роста. **Предметом** исследования в данной работе является процесс реализации инноваций с точки зрения построения инновационной инфраструктуры в рамках проектной методологии. **Целью** исследования является создание концепции эффективной системы обслуживания инновационного процесса с учетом особенностей внедрения методологии управления проектами. **Задачи:** Проанализировать особенности инновационной инфраструктуры. Рассмотреть способы финансирования стадий инновационного процесса с точки зрения проектной методологии. Рассмотреть возможность применения форсайтинга в рамках проектных методологий. Сформулировать задачу принятия решений по оценке инновационного потенциала региона. **Методы** исследования: логическое обобщение, анализ и синтез, структурный анализ. **Результаты:** Сформирован и описано основные элементы инновационной инфраструктуры как системы организационно-экономических форм и институциональных структур. Классифицированы элементы инновационной инфраструктуры по разным форумам. Предложено использовать дифференцированный подход к финансированию стадий инновационного процесса для различных проектных методологий (проектной, программной и портфельной). Сделан вывод о целесообразности использования форсайтинга для реализации инновационного подхода, именно как технологию долгосрочного прогнозирования. Сформирована схема связи методологии форсайтинга и проектной методологии создания ценностей. Формализованы элементы задачи принятия решений по оценке инновационного потенциала региона, построенную с использованием методологии программного подхода, который может быть использован региональными и государственными органами власти для оценки степени влияния того или иного фактора на состояние инновационного потенциала территории, а также для определения приоритетных направлений инновационного развития. **Выводы.** Рассматривая методологию управления программами через призму форсайтинга, можно увидеть главные результаты от внедрения этой методологии на производстве, и главное, что использование методологии форсайтинга переводит предприятие сразу на четвертый из пяти уровней технологической зрелости. То есть благодаря использованию приведенных выше методологий мы можем не только разработать и внедрить инновацию, но и спрогнозировать такое будущее, при котором выгода от внедренной инновации будет максимальной.

Ключевые слова: инновации, инновационная экономика, проектная методология, управление проектами, управление программами, форсайтінг.