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FEATURES OF FUNCTIONING OF INNOVATIVE DEVELOPMENT OF ENTERPRISES WITHIN THE FRAME OF TECHNOLOGY PARK

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Solntsev S. O., Gnitetskyi Ie. V. Features of Functioning of Innovative Development of Enterprises within the Frame of Technology Park

The aim of this article is to study the theoretical and methodological basics of innovative development of enterprises within the frame of technology park. During the study methods of system-structural analysis were used for allocation of stages of the innovative development of enterprises and their functioning within the frame of technology park; retrospective method was used for analyzing the evolution of concepts of the innovations theory. As result of the study was suggested to attract enterprises by means of market-based instruments and to evaluate the viability of innovations' implementation on basis of the sustainable development criteria. A study on functioning of enterprises within the frame of technology park has allowed to improve their functioning phases, based on complex interaction of the technology park members. Stages of innovative development of enterprises with a view to enhancing the efficiency of their interaction with the technology parks were allocated. A further study for the sector-specific issues of innovative development of enterprises within the frame of technology park is required. Practical significance of the obtained results provides an activation of innovation activity of enterprises. Social impact is seen in achieving the social and environmental effects from functioning of enterprises within the frame of technology park on the basis of elaborated stages. Value of the scientific work consists in use of market mechanisms for attracting enterprises to technology parks without involving of any State subsidies.

Key words: innovation activity, innovation activity of enterprises, technology park, functioning of enterprises.

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Солнцев С. О., Гнітецький Є. В. Особливості функціонування та інноваційного розвитку підприємств у межах технопарку

Метою статті є дослідження теоретичних і методичних засад функціонування та інноваційного розвитку підприємств у межах технопарку. У процесі дослідження використано методи системно-структурного аналізу – для виокремлення етапів інноваційного розвитку підприємств та їх функціонування в межах технопарку; ретроспективний метод – для аналізу еволюції понять теорії інновацій. У результаті дослідження запропоновано залучати підприємства за рахунок ринкових важелів і проводити оцінку перспективності впровадження інновацій за критеріями сталого розвитку. Дослідження процесу функціонування підприємств у межах технопарку надало можливість удосконалення етапів їх функціонування, що базуються на комплексній взаємодії учасників технопарку. Визначено етапи інноваційного розвитку підприємств з метою підвищення ефективності їх взаємодії з технопарками. Подальшого дослідження потребують питання галузевої специфіки інноваційного розвитку підприємств у межах технопарку. Практичне значення отриманих результатів полягає в активізації інноваційної діяльності підприємств. Соціальні наслідки – у досягненні соціальних та екологічних ефектів від функціонування підприємств у межах технопарку за запропонованими етапами. Цінність роботи вбачається в застосуванні ринкових механізмів залучення підприємств до технопарку без необхідності державних дотацій.

Ключові слова: інноваційна діяльність, інноваційна діяльність підприємств, технопарк, функціонування підприємств.

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Солнцев С. А., Гнітецький Є. В. Особенности функционирования инновационного развития предприятий в рамках технопарка

Целью статьи является исследование теоретических и методических основ функционирования инновационного развития предприятий в рамках технопарка. В процессе исследования использованы методы системно-структурного анализа – для выделения этапов инновационного развития предприятий и их функционирования в рамках технопарка; ретроспективный метод – для анализа эволюции понятий теории инноваций. В результате исследования предложено привлекать предприятия за счет рыночных рычагов и проводить оценку перспективности внедрения инноваций по критериям устойчивого развития. Исследование процесса функционирования предприятий в рамках технопарка позволило усовершенствовать этапы их функционирования, основанные на комплексном взаимодействии участников технопарка. Определены этапы инновационного развития предприятий с целью повышения эффективности их взаимодействия с технопарками. Дальнейшего исследования требуют вопросы отраслевой специфики инновационного развития предприятий в рамках технопарка. Практическое значение полученных результатов заключается в активизации инновационной деятельности предприятий. Социальные последствия – в достижении социальных и экологических эффектов от функционирования предприятий в рамках технопарка по разработанным этапам. Ценность работы состоит в применении рыночных механизмов привлечения предприятий к технопаркам без необходимости государственных дотацій.

Ключевые слова: инновационная деятельность, инновационная деятельность предприятий, технопарк, функционирование предприятий.

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The analysis of global experience proves that ensuring the economic growth of the country in general and of separate economic entities in particular requires relevant conditions and mechanisms which will foster the development of innovative activity. The transfer of scientific knowledge in new technologies and goods ensures the continuous economic development as evidenced by development of the leading EU countries. Thus, the development of science and its practical application in the operating processes serve the basis for development of innovative ventures, which is possible due to cooperation with science and technology parks. The efficiency of the development of innovative activity of enterprises through cooperation with science and technology parks is proved by global experience of the leading European countries.

In the meantime, the tendency for efficient use of resources and introduction of socially responsible business concept has been observed in the international community. The above tendencies have been implemented through adoption of the concept for sustainable development of the states. The concept of sustainable development is more and more affecting the development of economic entities throughout the world. However, if at macro level such concept may be implemented through normative acts and reforms, then its implementation at the level of enterprises requires significant changes, including intensification of innovative activity of enterprises and science and technology parks as one of the main tools of implementation of the principles of sustainable development.

The introduction of innovations by manufacturing enterprises was studied by the leading world and domestic scholars. The weighty contribution to the theory of innovations and its connection with marketing theory was made by such foreign scientists as P. Drucker, N. Mansfield, P. Santo, B. Twiss, and J. Schumpeter [9, 15]. The innovative development of the enterprises was also studied by I. T. Balabanov, S. V. Valdaitsev, S. V. Voitko, V. V. Dergachova, M. Z. Zhurovsky, P. N. Zavlin, D. M. Stechenko, R. A. Fatkhudinov and others [5, 8, 10, 11, 13]. The development of science and technology parks in Ukraine was highlighted in the works of S. M. Illiashenko, O. V. Kamianska, N. F. Pavlenko, O. S. Teletov and others.

However, theoretical foundations of the market-oriented innovative development of enterprises of science and technology park require further development of theory due to the limitations of the functioning models of science and technology parks in Ukraine, which induces the relevance of further theoretical developments in this direction.

The purpose of the article is to study the theoretical and methodological grounds of operation and innovative development of enterprises within science and technology park.

On the basis of generalized scientific works, the economic nature of the categories of theory of innovations was analysed, and three basic categories which do not have a straightforward interpretation, namely, *novation*, *novelty*, and *innovation*, were identified. The foreign literature mostly does not differentiate novelty and *innovation*, while Russian and Ukrainian scholars mostly interpret them in different ways [5, 8, 10, 11]. On the basis of analysis of the etymological origin of innovation, there have been defined three approaches to its interpretation: 1) object approach – innova-

tion is seen as a certain result in the form of new technology, new product, method, etc.; 2) process approach – innovation is seen as a process of introduction of certain changes; 3) transformation approach – changes in the activity of the enterprise.

The analysis of the interrelation of such categories as *novation*, *novelty*, *innovation*, *innovative activity*, *innovation process* gave the possibility to define that novelty is an embedded novation that in the process of market diffusion becomes innovation, and novation is a new method, goods, raw materials, technology, etc. The gradual transition from novation to innovation is an innovation process. In turn, the innovative activity is a broader category and covers, in addition to the innovation process, search for novations, their adaptation or development, procedure of introduction, etc. The approaches to defining the *innovative activity* were analysed [5, 8, 10, 15]. Thus, it was determined that the innovative activity depends on the economic entity. Based on the results of the research, it is offered to define the "innovative activity of science and technology park" as an arrangement of the activity of enterprises, research institutions and other participants of science and technology park aimed at ensuring the teach by innovative products of the result suitable for use by manufacturing enterprises in order to create sustainable competitive advantages through coordination of economic interests of all participants of science and technology park. Accordingly, the relation between the innovative activity of the enterprise, activity of science and technology parks, and implementation of the concept of the sustainable development at enterprises and science and technology parks is to achieve the same effects for economic entities.

To identify the ways of improving the efficiency of operation of science and technology parks, the elements of innovation infrastructure in Ukraine and in the world, as well as their correlation with science and technology parks and differences in functions of engineering and manufacturing structures were analysed. The following problems of application of global models of science and technology parks in Ukraine have been identified [10, p. 39; 13, p. 120]:

- ✦ a small number of innovative enterprises;
- ✦ financing of solutions;
- ✦ lack of smoothly running system of interconnections between research institutions, manufacturing enterprises, science and technology parks, and investors;
- ✦ weak interconnection between solutions developed at research institutions being a part of science and technology parks, and needs of manufacturing enterprises;
- ✦ lack of consistent action plan to build engineering and manufacturing structures, science and technology parks in particular;
- ✦ failure by the enterprises to realize the necessity to introduce innovations; lack of efficiently operating business incubators, etc.

Based on the results of the research of the concept of sustainable development and components of efficiency of the innovative activity of enterprises of science and tech-

nology park and science and technology park as an independent economic entity, the groups of social, financial and economic, and environmental indices were identified. The marketing problematics as to implementation of the concept of sustainable development is grounded, and the introduction of the group of marketing indices in the course of analysis of the correspondence of activity of the science and technology parks and enterprises to the concept of sustainable development was offered. The indices for assessment of innovation according to the concept of sustainable development divided into four groups (financial and economic, environmental, social, and marketing) were defined for each group of indices (Table 1).

Table 1

Indices for Innovation Assessment

Group of Indices	Index
Financial and economic	Corporate profit
	Operating profitability
	Capitalization through tangible and intangible assets
Ecological	Energy intensity of production
	Resource intensity of production
	Level of equipment depreciation
	Level of toxic industrial waste
Social	Additional working places
	Salary level
	Social package
	Safety of working places
	Education and qualification of personnel
Marketing	Competitive capacity of enterprise
	Level of supply
	Development of new trading outlets
	Raising of awareness
	Level of consumer satisfaction

Source: made by author based on reference list [10, p. 31; 6, p. 23; 14]

These indicators serve the basis for decision-taking on compliance of innovations with the concept of sustainable development, as well as the basis for their assessment as to compliance with prospects of implementation at the manufacturing enterprises.

On the basis of the analysis of activity of the science and technology parks and innovative activity of the enterprises the tendency to intensification of the innovative activity in order to create competitive advantages in the market is outlined. However, the tasks faced by the enterprises are not solved in full due to lack of infrastructure for introduction of innovations. In addition, the organizational structure of science and technology parks existing in Ukraine prevents from using a significant amount of the benefits from joint development due to imperfections in the organizational structure. Thus, it is determined that the activity of the enterprises of science and technology park should be based on functional and structural approach to creating the science

and technology park, as well as market basis of attraction of enterprises, and should include assessment of prospects of introduction of the innovations. This enables a more efficient use of internal resources of the enterprise, reduction of the innovation cycle, release of additional resources for innovation activity of enterprises in order to create sustainable competitive advantages.

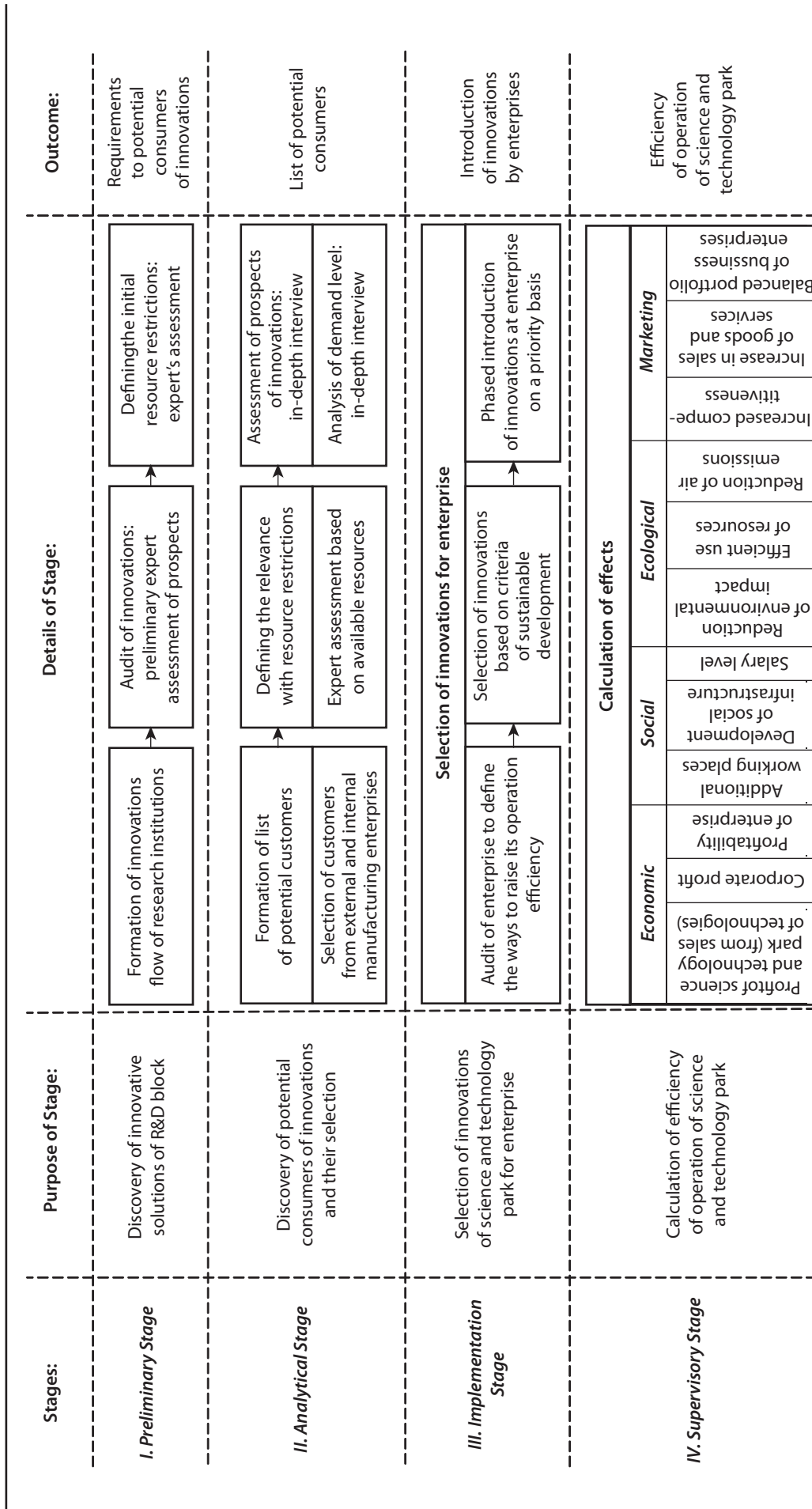
One of the most important components of the organizational structure of the developed model of science and technology park is the formation of information flows in order to spread information about solutions of science and technology park and effects from their introduction. The proposed structure of science and technology park allows to solve the following problems of operation of science and technology parks in Ukraine: fostering formation of small and medium-sized innovation enterprises; intensification of the innovation activity of the enterprises with no significant resources attracted, as well as the possibility of formation of additional competitive advantages; increase in opportunities of financing of innovative solutions on account of concentration of the resources of enterprises and research institutions; adjustment of the network of interactions among research institutions, manufacturing enterprises, and science and technology parks; development of innovative technologies for target consumer.

To implement the developed model, the following procedure of operation of enterprises of science and technology parks is offered (Pic. 1).

This procedure involves several stages. At the initial, *preliminary*, stage, the identification and analysis of innovative solutions available at research institutions, which forms the requirements to their potential customers, are conducted. At the second, *analytical*, stage, the potential consumers of innovative solutions and compliance with consumer needs are analysed. At the third, *implementation*, stage, the innovations that can be introduced at the enterprise in accordance with the sustainable development concept that is the basis for formation of sustainable competitive advantages of the enterprise are selected. At the final, *supervisory stage*, the efficiency of operation of science and technology park and enterprises according to four groups of indices (financial and economic, social, environmental, and marketing ones) is assessed.

In the course of innovative development of enterprises of science and technology parks and with the purpose to enhance their innovative activity, it is advisable to act in two directions as follows: 1) to identify the ways to raise the efficiency of enterprise based on groups of indices of sustainable development within the basic scope of corporate activity; 2) to evaluate the portfolio of business lines of enterprises based on groups of indices of sustainable development (Pic. 2).

The first block of tasks is offered to be discharged through the following stages: 1) preliminary, 2) analytical, and 3) implementation ones. At the preliminary stage, the activity of the enterprise is analysed; and the potential areas of introduction of innovation and collection of information to assess innovation are identified. For this purpose, the initial limitations for innovations are outlined. They include



Pic. 1. Stages of Operation of Enterprises of Science and Technology Parks

Source: developed by author [1 – 4; 7; 12; 13; p. 206].

own financial resources; attracted financial resources; legislative restrictions; raw materials; intellectual resources; engineering and manufacturing resources; and strategic goals of the enterprise. With respect to raw materials, intellectual, and engineering and manufacturing restrictions, the correlation with financial resources of the enterprise is inherent. Thus, in case of additional funding, the initial restriction will be available financial resources of the enterprise.

To define the "bottleneck" of the enterprise, it is offered to make an analysis based on the model of the existing organizational structure with all kinds of flows, namely, trade, information, finances, raw materials, etc. Based on such analysis, the potential areas where innovations are to be introduced, as well as the innovations which may be introduced, are outlined. The analysis is conducted for the following types of innovations: trade, technological, raw materials, market, and organizational ones. In the course of analysis, the list of resources required for their introduction at the enterprise is made. After that, the innovations are filtered based on resource and legislative restrictions, and the final list of innovations is made. At the analytical stage, the innovations are assessed on the basis of indices of sustainable development, and the innovations potentially to be introduced by manufacturing enterprises are outlined. The method of analytic hierarchy process for assessment of innovations based on indices of sustainable development (which include four groups of indices, namely, financial and economic, environmental, social, and marketing ones, each having its weight value) is offered to be applied. Weight values are defined by internal and external experts to ensure unbiased treatment by the managers of the enterprise. To

calculate an integral value for every innovation the following formula is used:

$$R_n = \sum_{i=1, j=1}^{m, l} w_i \cdot q_j \cdot C_{ij},$$

where R_n – integral scoring of the n -th innovation based on indices of sustainable development;

N – index number of innovation;

W_i – weight value of the first-level index of the hierarchy;

q_j – weight value of the second-level index of the hierarchy;

C_{ij} – innovation scoring under the ij -th index.

Based on the assessment, each innovation is scored, and the most perspective innovations to be introduced at the enterprise are defined. The obtained data serve the basis for multifactor model of introduction of innovations. To reach a compromise between limited resources of the enterprise and identified innovations which require the resources for introduction, the innovations are ranked, and the relevant financial resources for each innovation necessary for its introduction are determined. As a result of applying the procedure of innovative development, the fullest range of innovations that may be introduced at the enterprise is defined.

CONCLUSIONS

On the basis of study of features of the innovative activity of national enterprises, the conceptual framework for operation of the enterprises of science and technology park is formed. It is based on functional and structural approach to the creation of science and technology park, as well as

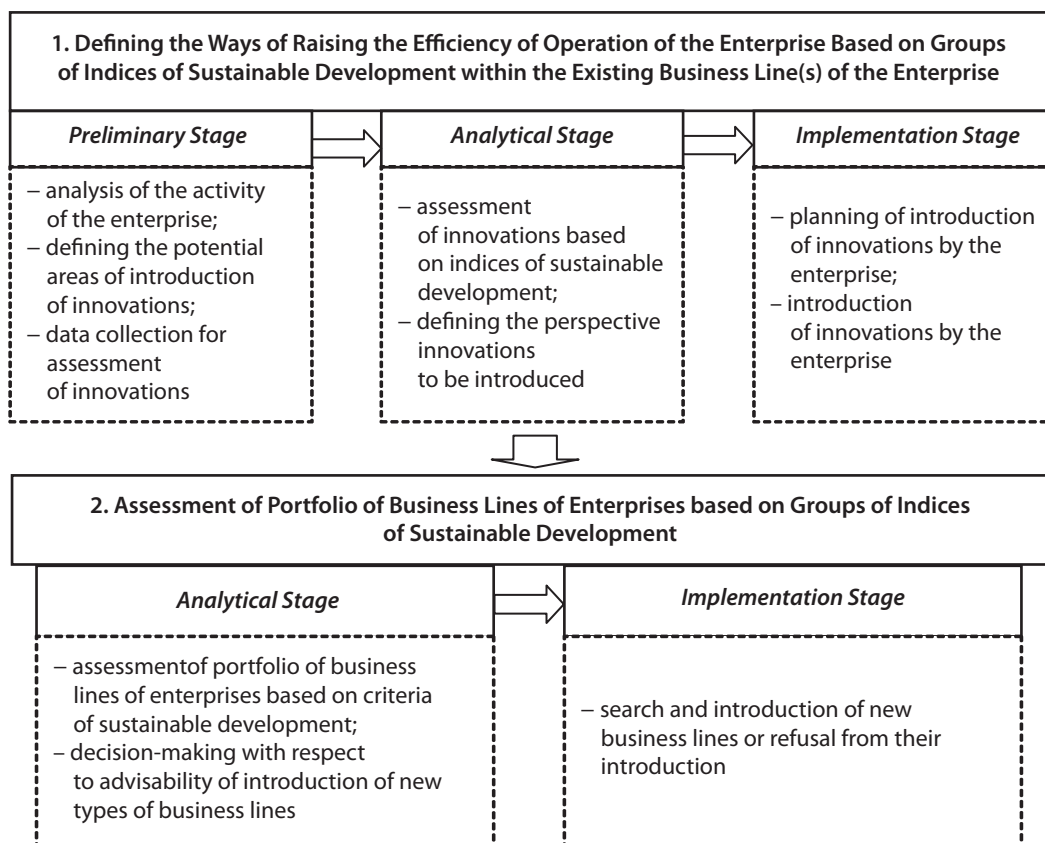


Fig. 2. Stages of Innovative Development of Enterprises within Science and Technology Park [4]

market mechanism for attraction of enterprises which involves identifying of the internal reserves of the enterprise, and includes assessment of prospects of introduction of innovations based on sustainable development. The introduction of the developed procedure of operation of enterprises of science and technology park comprises four stages: 1) analysis of innovative solutions of science and technology park, 2) identification of potential consumers of innovations, 3) selection of innovations of science and technology park for the enterprise based on criteria of sustainable development, and 4) assessment of the efficiency of operation of science and technology park.

Fostering the innovative activity of enterprises is envisaged on the basis of the gradual innovative development of enterprises within the science and technology park. At the first stage, the innovations which may be introduced at the enterprise within the existing types of activity are offered to be assessed. At the second stage, the business as a whole based on indices of sustainable development is offered to be assessed. This gives the possibility to diversify the activity of the enterprise in case the main type of its activity is not in line with the indices of sustainable development, as well as to ensure sustainable competitive advantages for all types of activity, and to foster the innovative activity of enterprises without significant additional resources. ■

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