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PETROVA R., MOSKAVTSOVA K.
Kharkiv National University of Radioelectronics**INFORMATIONAL AND ANALYTICAL MODELLING OF DEVELOPMENT
PROCESS OF INNOVATION INVESTMENT STRATEGY AT HIGH-TECH ENTERPRISE**

The given work is devoted to the stages of innovation investment strategy model of high-tech enterprise, introduced by the authors. It focuses on the theoretical basis of the aforementioned model and gives description of every stage of the model. The result of the model proceeding is the determination of foreground innovation investment directions, which form the innovation investment strategy.

Keywords: informational and analytical model, innovation investment strategy, high-tech enterprise.

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Харківський національний університет радіоелектроніки**ІНФОРМАЦІЙНО-АНАЛІТИЧНЕ МОДЕЛЮВАННЯ
ПРОЦЕСІВ РОЗРОБКИ ІННОВАЦІЙНО-ІНВЕСТИЦІЙНОЇ СТРАТЕГІЇ
ВИСОКОТЕХНОЛОГІЧНОГО ПІДПРИЄМСТВА**

Робота присвячена етапам моделі інноваційної інвестиційної стратегії високотехнологічного підприємства, запровадженій авторами. Він спирається на теоретичну основу вищезгаданої моделі та дає опис кожного етапу моделі. Для багатьох підприємств, а особливо для великих виробничих підприємств, інновації є одним із напрямків інвестування. Інвестиції в інновації та впровадження інновацій допомагають підвищити ефективність виробничого процесу, а на останніх етапах це дозволяє зменшити змінні витрати. Результат модельної роботи спрямований на визначення напрямків інноваційних інвестицій, які формують інноваційну інвестиційну стратегію. Стаття спрямована на розробку інформаційно-аналітичної моделі інноваційної інвестиційної стратегії. Для досягнення цієї мети, яка визначає підприємство як високотехнологічне та описує всі етапи моделювання інноваційної стратегії інвестування, починаючи від мети моделювання та закінчуючи розрахунками. В цілому сучасний рівень економічного розвитку спричиняє інтенсивні зміни на підприємствах, які пов'язані з інноваціями та мотивує інвестиції в інноваційні процеси та технології. Моделювання інноваційної та інвестиційної стратегії на високотехнологічних підприємствах повинно здійснюватися у кілька етапів, включаючи визначення мети моделювання, джерел інвестування, показників, які потребують вдосконалення тощо. В результаті теоретичного дослідження з'явилася модель інноваційної та інвестиційної стратегії, яку можна застосувати до високотехнологічної діяльності тощо, наприклад, сільського господарства, легкої, гірничої промисловості тощо. Хоча тема є досить важливою та актуальною, така модель раніше не була описана в економічній літературі.

Ключові слова: інформаційно-аналітична модель, інноваційна стратегія інвестування, високотехнологічне підприємство.

Introduction. Innovations and innovative technologies have a vital role in the business activity of many enterprises at the current stage of economic development. In general, innovation is the final result of innovative activity, which has spread as a new or improved product, implemented at the market, new or improved technological process, used in the practical activity [1]. Implementation and application of innovations are connected not only with the main kinds of business activity; it is engaged in all the kinds of activities of the enterprise, which implements the innovations, and is aimed at the increase in its efficiency.

Analysis of previous studies. Although the topic is quite important and actual, such a model has not been described in the economic literature previously. The necessary theoretical basis for modelling was built using the works of Khakimova, Smolinsky, and Serba. The issues of modelling the investment and innovative activity of the enterprise, the approaches of classification of the innovation investment strategy are described in the aforementioned works.

Importance of innovation investment strategy at high-tech enterprise. For many enterprises, and especially for large manufacturing enterprises, innovations are one of the investment directions. The investment in innovations and implementation of innovations help to raise the efficiency of the manufacturing process, and at the latter stages, it allows decreasing the variable costs. Hence, many enterprises transform investments in innovations from temporary measures into an innovation investment strategy. The innovation investment strategy is one of the alternative ways of achieving strategic goals based on the implication and direction of investment into innovative ways of development. In contemporary circumstances, exactly this way gives the ability to form competitive advantages and to create the circumstances for the effective activity in the long term.

The article is aimed at the elaboration of an informative-analytical model of innovation investment strategy. To achieve this goal, it is necessary to identify the criteria, which define the enterprise as a high-tech one and describe all the stages of modelling the innovation investment strategy, beginning from the goal of modelling and finishing with the calculations.

At most, the innovations affect high-tech enterprises. A high-tech enterprise is an enterprise, which manufactures high-tech production, and also develops and markets new products and/or innovative production

processes through the systematic use of scientific and technical knowledge [2]. An enterprise can be identified as a high-tech one by the following range of criteria:

– a massive percent of its production (20–25 %) is the high-tech production, competitive at the international market;

- development and manufacturing of new kinds of products and/or new technical processes;
- usage of mostly interim high-tech production for manufacturing the final goods or services;
- a massive part of the staff have technology-oriented professions;
- a high volume of investment for the technical and technological re-equipment [3].

Considering the definition and criteria of a high-tech enterprise, it can be concluded that the innovation and investment strategy of such enterprises is organic.

Modelling of the innovation investment strategy at high-tech enterprise

The efficiency of innovation investment strategy at the high-tech enterprise is a vital issue. The evaluation of innovation investment strategy efficiency at a high-tech enterprise may be done using the methods of modelling. However, the efficiency evaluation of the innovation investment strategy is not the only goal of the modelling [4].

The model of innovation investment strategy at the high-tech enterprise can be also a mean for solving the following tasks:

- planning investment and innovation investment activity of the enterprise;
- accounting the peculiarities of a high-tech enterprise during the strategy development;
- engineering and re-engineering of business processes of the enterprise;
- structuring the sources and directions of investments at the enterprise [5].

Some peculiarities in the activity of the high-tech enterprise have to be taken into account during the process of modelling of its innovation investment strategy:

- fast and unpredictable changes in markets and technologies;
- the necessity to use the methods of foresight and technological prognoses;
- the difficulty of the business cost evaluation;
- implementation of the educative organizations' principles;
- prevalence of adaptive structures [6].

The aforementioned peculiarities have to be included into the innovation investment strategy model of a high-tech enterprise.

The main financial indicators of high-tech enterprises, which characterize the economic activities of high-tech enterprises, is the degree of innovation of financial resources (the excess funds to ensure the production process and innovation) indicators of sufficiency of own financial resources, profitability of turnover (sales), profitability of assets, coefficient of turnover of working capital, the percentage of value added revenue from sales.

Improvement of each of these indicators certifies the raise in the enterprise activity efficiency. The core of the innovation investment strategy is the investment into such kinds of innovations and innovative technology that will improve some of the aforementioned indexes [7].

The algorithm of modelling the innovation investment strategy of a high-tech enterprise can be as shown in Figure 1:

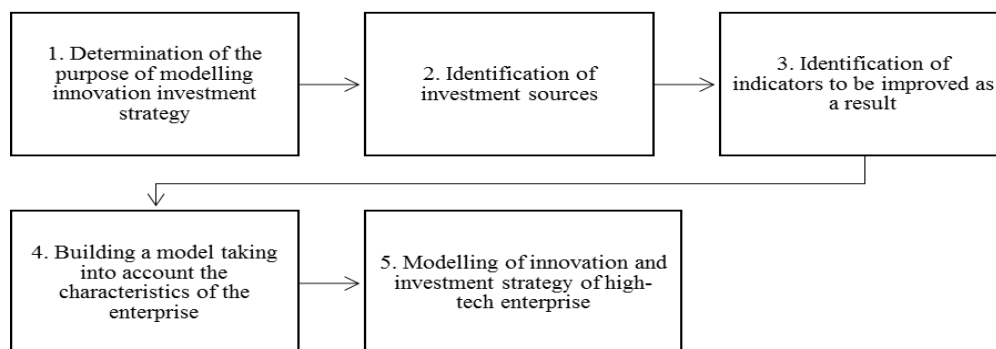


Fig. 1. Algorithm of modelling of innovation and investment strategy of high-tech enterprise

The second stage of the modeling algorithm is to determine the sources of investment. They can be marked as i_j , $j=1, n$, де i – total value of innovation investment from the source j .

The value of innovation investment I can be counted as follows (1):

$$I = \sum_{i=1}^n i_1 + i_2 + \dots + i_j \quad (1)$$

Finding the total amount of gross investment in innovation (1) is one of the ways to streamline the sources of innovative investment at a high-tech enterprise.

If the purpose of the strategy modelling is planning, then the model includes all the financial indicators of the high-tech enterprise. They can be marked the following way:

- the degree of innovation of financial resources – S;
- indicators of self-financing – F;
- indicators of possible borrowing – D;
- return on turnover (sales) – Ro;
- return on assets – Ra;
- the coefficient of negotiability of negotiable medium-KOOK;
- the share of value added in sales revenue is Kav.

When calculating the model, each of the indicators will be equal to 1.

The next stage of modeling is ranking. Based on the economic situation of the enterprise, its main directions and priorities of activity, the above indicators are ranked from 1 to 7, where 1 indicator is the most important for a high-tech enterprise, and 7 indicator is the least important. Each of the ranks has a corresponding k_m coefficient, where m is the rank number: k_1 corresponds to 1 rank, k_2 corresponds to 2 ranks and so on. According to the rank, investments should also be redistributed. The rank coefficients are listed in table 1.

Table 1

Rank coefficients

Rank	Rank coefficient
1	$k_1=0,3$
2	$k_2=0,2$
3	$k_3=0,15$
4	$k_4=0,1$
5	$k_5=0,09$
6	$k_6=0,08$
7	$k_7=0,08$

Thus, the model of innovation and investment strategy in general can be presented as follows (2):

$$\begin{cases} I = \sum_{j=1}^n i_1 + i_2 + \dots + i_j \\ I = (I \times k_m \times P_m) \end{cases}, \quad (2)$$

where P_m – operation record of high-tech grade enterprise m .

If one of the indicators is not included in the model (2), the lowest rank coefficient is proportionally distributed between the other coefficients.

Despite the fact that this model is focused on the use of high-tech enterprises, it can also be applied to enterprises in other areas of economic activity that invest in innovative technologies or develop an innovative investment strategy.

Summary. Overall, the modern level of economic development causes intensive changes at the enterprises, which are connected with the innovations, and motivates investments in innovative processes and technologies. Modeling of innovation and investment strategy in high-tech enterprises should be carried out in several stages, including the definition of the purpose of modeling, sources of investment, indicators that require improvement, and the like. As a result of the theoretical study, a model of innovation and investment strategy was obtained, which can be applied to enterprises engaged in high-tech activities, or others, for example, agricultural, light, mining and the like.

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