

THE METHODOLOGICAL APPROACH TO THE COST EVALUATION OF INDUSTRIAL PROPERTY ITEMS

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The fundamental elements of the economy of knowledge include the concept of intellectual property, whose lion's share is represented by industrial property. The situation when industrial property items are not only used by the enterprises where they were developed, but are also transferred to other economic entities on various terms is widespread in the market economy. Technology transfer (hereinafter referred to as TT) takes place.

However, while evaluating the cost of a specific industrial property item on the stage of its development, pilot production etc. within the enterprise, it is somewhat more complicated to form a monetary evaluation of such item in view of its transfer. It is for this purpose that National Standard No. 4 "Evaluating the property rights of intellectual property" [1] providing for the use of the income, cost or comparative approaches has been developed (Decree 1185, 2007, General Information, Clause 8). However, the conducted study of methodological support within the framework of each of these approaches proves that the existing methods do not always justify the price of an innovative product.

Doubtless, there is a vast number of situations associated with evaluation of industrial property items, and it is objectively impossible to describe each of them personally. Yet it is advisable to create a certain set of formalized expressions which can be operated in various situations.

Despite the fundamentality and scholarly importance of the proposed developments, no methodology of intellectual property item evaluation taking into account TT and containing the explications of the monetary evaluations of industrial property items has been formed yet.

The purpose of the work is to improve the formation methods of the monetary evaluation of intellectual property items within the framework of the cost approach and in view of further transfer of such properties.

In general terms, the monetary evaluation of industrial property items (P_0) within the framework of the cost approach is performed in the following way [2, 3]:

$$P_0 = \left(\sum_{t=t_s}^{t_e} P_t \cdot \sigma_t \right) \cdot K_{ob} \cdot K_{bon} \quad (1.1)$$

where P_t is the monetary evaluation of an industrial property item in the t^{th} year of the calculation period, MU; t_s is the start year of the calculation period (the start year of the effect of the exclusionary rights for an industrial property item); t_e is the final year of the calculation period (the year of the cost estimation of an industrial property item); σ_t is the ratio of reduction of diachronous monetary evaluations to the calculation year level; K_{ob} is the ratio accounting for the level of industrial property item obsolescence (for inventions, industrial designs and utility models) that is obtained from the following expression:

$$K_{ob} = 1 - (T_f \div T_n) \quad (1.2)$$

(where T_n is the nominal period of validity of the title of protection; T_f is the period of validity of the title of protection in the calculation year t); K_{bon} is the bonification ratio (engineering and economic significance ratio, for inventions only) of the industrial property item.

The ratio of reduction of diachronous valuations to the calculation year level is obtained from the following expression:

$$\sigma_t = (1 + E_m)^{t_c - t}, \quad (1.3)$$

where E_m is the diachronous monetary evaluation reduction rate, t_c is the calculation year; t is the year when the monetary evaluation is reduced to the calculation year level. The monetary evaluation of an industrial property item P_t is obtained from the following expression:

$$P_t = P_t^d + P_t^l + P_t^m, \quad (1.4)$$

where P_t^d are the costs of the development of the industrial property item in year t , MU; P_t^l are the costs of legal protection of the industrial property item in year t , MU; P_t^m are the marketing costs of the industrial property item in year t , MU. The list of the expenses has been expanded and specified by P. Tsybuliov [3].

However, this method can be only used to determine the approximate value of the cost of an industrial property item. On the one hand, the method implies taking into account the asynchronicity of the evaluations, their reduction to the calculation year level (expression 1.3). On the other hand, some types of the expenditures planned for the development, production and promotion of an industrial property item (expression 1.4) are objectively difficult and at times impossible to predict for the future periods in practice. The effective value assessment of industrial property items requires a justification of cost values within the framework of the approach given.

We suggest that the cost values should be adjusted by calculation period year using the adjusting elements of the sliding price. The sliding price (P_{pl}^{sl}) determination method has the following mathematical description:

$$P_{pl}^{sl} = P_{bas}^{sl} \cdot \left(Pr_1 + Pr_2 \cdot \frac{m_1}{m_0} + Pr_3 \cdot \frac{l_1}{l_0} + Pr_4 \cdot \frac{e_1}{e_0} \right) \div 100, \quad (1.5)$$

where P_{bas}^{sl} is the basic price of the product, MU, Pr_1 is the proportion of fixed expenses in its first cost, %; Pr_2 is the proportion of raw and other material costs, %; Pr_3 is the proportion of labor costs, %; Pr_4 is the proportion of fuel and energy costs, %; m_1 and m_0 are the cost of raw and other materials in the accounting and base periods, MU; l_1 and l_0 are the labor costs in the accounting and base periods, MU; e_1 and e_0 are the costs of fuel and energy in the accounting and base periods, MU.

Thus, the expenditures within the first cost of products may be adjusted with the help of the corresponding ratios using method (1.5). However, we believe it is necessary to specify the adjusting instruments for the economic elements of semi-variable and semi-fixed costs.

Drawing upon the theoretical and practical studies of scholars, we have determined and reviewed the adjusting instruments for the economic elements of the expenditures within the first cost of products, particularly the inflation index that reflects the depreciation of the national currency (determined using the reference books developed and submitted by the State Statistics Service of Ukraine annually). Taking this indicator into account is important due to the fact that the consumer and wholesale price indexes, the indicators of the monthly, quarterly and annual changes in the cash expenses necessary for the population to purchase consumer goods and services, are used to determine it. The above is an instrument necessary to adjust both semi-variable and semi-fixed costs of the production of an enterprise's industrial property item.

Important expense management factors include accounting for the change in the minimum wage value and, consequently, in all types of payroll charges, as well as the changes in fuel and electric power price (all values being determined according to the data from the State Budget of Ukraine).

Additionally, we believe it is reasonable to propose the individual index of the enterprise to determine the change in the prices of the materials used by the enterprise to produce this particular industrial property item over a certain period of time. The following expression has been suggested:

$$I_m = \frac{P_{n1}^m}{P_{n0}^m}, \quad (1.6)$$

where I_m is the individual enterprise material price index; P_{n1}^m is the material price (calculations for each respective n material of the multitude of n materials are advisable) in the accounting year, MU; P_{n0}^m is the material (n material of the multitude of n materials) price in the base year, MU.

This index is suitable for use in the $\frac{m_1}{m_0}$ part of expression (1.5), which will allow specifying the change in the value of certain economic elements of the "materials" expenditure item and form the m indicator in this method with enhanced accuracy.

An index of similar nature is also suitable for adjusting the economic elements of the "raw material":

$$I_r = \frac{P_{n1}^r}{P_{n0}^r}, \quad (1.7)$$

where I_r is the individual enterprise raw material price index; P_{n1}^r is the raw material price (calculations for each respective n raw material type of the multitude of its n types) in the accounting year, MU; P_{n0}^r is the raw material (n raw material type of the multitude of n types of raw material) in the base year, MU.

While using expression (1.5), the issue of determining the basic price of the product (P_{bas}^{sl}) arises. Numerous methods of establishing such price depending on the specifics of the manufacturing process, the enterprise or the industry exist. However, insufficient attention is paid in the existing academic and practical literature to the case of basic price formation for an industrial property item considered to be innovative.

In case of basic price formation for an improved, advanced industrial property item, it is advisable to use parametric price formation, in particular the method of consequential accounting for numerical parameter values in the price.

Mathematically, the parametric price formation model for a new industrial property item looks so:

$$\frac{P_{new}}{P_{ex}^i} = \left(\frac{Pr_{new}}{Pr_{ex}^i} \right)^k, \quad (1.8)$$

where P_{new} is the price of a new product to be determined, MU; P_{ex}^i is the price of the i^{th} existing product that is known and used as a basis for reference, MU; Pr_{new} , Pr_{ex}^i are the parameter values of the new product and of the i^{th} existing product; k is the braking power factor accounting for the lagging of the product price behind the increase in the numerical value of a certain selected parameter.

The expression given accounts for the adjusting factors for each of the products participating in the comparison. Particularly, if there are parameters a , b , c , d by which an industrial property item is compared with other similar products, then the adjusting factors, e.g., for the four products under comparison are determined in the following way:

by parameter a :

$$K_{ex}^{1a} = \left(\frac{a^{new}}{a^{1ex}} \right)^k; K_{ex}^{2a} = \left(\frac{a^{new}}{a^{2ex}} \right)^k; K_{ex}^{3a} = \left(\frac{a^{new}}{a^{3ex}} \right)^k; K_{ex}^{4a} = \left(\frac{a^{new}}{a^{4ex}} \right)^k \quad (1.9)$$

by parameter b :

$$K_{ex}^{1b} = \left(\frac{b^{new}}{b^{1ex}} \right)^k; K_{ex}^{2b} = \left(\frac{b^{new}}{b^{2ex}} \right)^k; K_{ex}^{3b} = \left(\frac{b^{new}}{b^{3ex}} \right)^k; K_{ex}^{4b} = \left(\frac{b^{new}}{b^{4ex}} \right)^k \quad (1.10)$$

by parameter c :

$$K_{ex}^{1c} = \left(\frac{c^{new}}{c^{1ex}} \right)^k; K_{ex}^{2c} = \left(\frac{c^{new}}{c^{2ex}} \right)^k; K_{ex}^{3c} = \left(\frac{c^{new}}{c^{3ex}} \right)^k; K_{ex}^{4c} = \left(\frac{c^{new}}{c^{4ex}} \right)^k \quad (1.11)$$

by parameter d :

$$K_{ex}^{1d} = \left(\frac{d^{new}}{d^{1ex}} \right)^k; K_{ex}^{2d} = \left(\frac{d^{new}}{d^{2ex}} \right)^k; K_{ex}^{3d} = \left(\frac{d^{new}}{d^{3ex}} \right)^k; K_{ex}^{4d} = \left(\frac{d^{new}}{d^{4ex}} \right)^k \quad (1.12)$$

With regard to the factors defined in this way, the specified prices of the four existing products will be:

$$P^1 = P_{ex}^1 \cdot K_{ex}^{1a} \cdot K_{ex}^{1b} \cdot K_{ex}^{1c} \cdot K_{ex}^{1d} \quad (1.13)$$

$$P^2 = P_{ex}^2 \cdot P_{ex}^{2a} \cdot P_{ex}^{2b} \cdot P_{ex}^{2c} \cdot P_{ex}^{2d} \quad (1.14)$$

$$P^3 = P_{ex}^3 \cdot P_{ex}^{3a} \cdot P_{ex}^{3b} \cdot P_{ex}^{3c} \cdot P_{ex}^{3d} \quad (1.15)$$

$$P^4 = P_{ex}^4 \cdot P_{ex}^{4a} \cdot P_{ex}^{4b} \cdot P_{ex}^{4c} \cdot P_{ex}^{4d} \quad (1.16)$$

Then, the price of the new industrial property item will amount to the arithmetic mean of the four above prices of similar items:

$$P = \frac{P^1 + P^2 + P^4 + P^5}{4} \quad (1.17)$$

Thus, (P_{bas}^{sl}) from expression (1.5) may be determined from expression (1.8).

However, the proposed adjustments to expression (1.5) can be applied in the case of value formation of such industrial property items for which analogues can be found and similar items can be selected. The drawback of the method is that finding such information is actually quite complicated.

On the other hand, it is obvious that the basic price (P_{bas}^{sl}) is a price in the breakeven point, i.e. equal to the total planned expenses for the production of an industrial property item in t_c period. Such suggestion is further confirmed by the fact that the final price is formed after the end of the whole manufacturing period. I.e., it can be quite justifiably considered that $P_{bas}^{sl} = P_t$ in the corresponding period.

Then, upon making the corresponding transformations to expressions (1.1) and (1.5), the following is obtained:

$$P_0 = \left(\sum_{t=t_s}^{t_e} (P_t \cdot \left(Pr_1 + Pr_2 \cdot \frac{m_1}{m_0} + Pr_3 \cdot \frac{l_1}{l_0} + Pr_4 \cdot \frac{e_1}{e_0} \right) \div 100) \cdot \sigma_t \right) \cdot K_{ob} \cdot K_{bon} \quad (1.18)$$

- The advantages of the method proposed include:
- a higher prediction precision level of the economic elements of expenses within the first cost of an industrial property item, which allows using this method in long-term planning;
- an opportunity to account for the following in expense planning: the existing adjusting economic and statistical indicators specially developed for such purposes (inflation indexes etc.); the state-approved values of certain economic elements of expenses (minimum wage, fuel and electric power etc.); other adjusting indicators subject to calculation, particularly the (revenue, turnover) value indexes of the enterprise and indexes of physical volume of production, risk factors etc.;
- using the proposed individual price indexes of the enterprise (for materials, raw material etc.).

The “bottleneck” is that the proportion of the expenses in the first cost may also change in each calculation period, which requires this proportion to be additionally calculated.

1. *The Cabinet of Ministers of Ukraine (1996), Decree. Pro zatverdzhennja Nacional'nogo standartu №4 "Ocinka majnovyh prav intelektual'noi vlasnosti". Available at: zakon1.rada.gov.ua/laws/show/1185-2007-n (ukr). [Accessed 03 May. 2015]*

2. *Zlepko, S. et al. (2010) Intelektual'na vlasnist' v nauково-tehničnij dijtal'nosti. Vinnycja: Vinnyc'kyj Nacional'nyj tehničnyj universytet.*

3. *Tsybuliov, P. et al. (2005) Upravlinnja intelektual'noju vlasnistju. Kyi'v: "K.I.S."*