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It has been substantiated that personnel is the driving force of innovative development of enterprises. The interrelation of the components of the formation of innovativeness of the company's personnel, such as innovative potential, the innovative activity of employees, and the effectiveness of their innovative activity was demonstrated. A comprehensive approach to assessing the innovativeness of the company's personnel, which consists of six stages describing the procedure of such evaluation, was proposed. It was proved that it is appropriate to evaluate the innovativeness of the company's personnel in the areas of innovative activity of employees and the effectiveness of their innovative activities. The systems of partial, integrated, and general indicators of innovativeness of the company's personnel and criteria for assessing its level were proposed. A system of indicators of innovative activity of personnel based on qualimetric assessment of their innovative potential was offered. The procedure for assessing the level of innovative activity of employees was improved by introducing a partial indicator of personnel's desire to carry out innovative activities. A system of indicators for assessing the effectiveness of innovative activities of personnel, including two groups, was proposed. The first group of partial indicators characterizes the effectiveness of innovative activity of the company's personnel, the second group focuses on the effectiveness of commercialization of innovative products. To determine the level of innovativeness of the company's personnel, a matrix that combines assessment of the levels of innovative activity and effectiveness of innovative activities of employees was proposed. The results of the study make it possible to determine the level of innovativeness of personnel, to develop an effective strategy for the creation and commercialization of innovative products of an enterprise

Keywords: innovation potential of personnel, innovative activity, innovative products, objects of intellectual property, effectiveness of innovative activity

DEVISING AN INTEGRATED APPROACH TO ASSESSING THE INDICATORS OF PERSONNEL INNOVATIVENESS UNDER CONDITIONS OF INNOVATIVE DEVELOPMENT OF AN ENTERPRISE

Maryna Adamenko

Corresponding author

PhD, Associate Professor*

E-mail: adamenko@ua.fm

Oksana Kornukh

PhD, Associate Professor*

*Department of Finance of Business Entities and Innovative Development

Kryvyi Rih National University

Vitaly Matusevich str., 11, Kryvyi Rih, Ukraine ,50027

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1. Introduction

The economic development of an enterprise requires new approaches to innovation-oriented management. No doubt, it is impossible to imagine the current economic state of enterprises without innovations. Innovative directions of production activity, production organization, work with personnel that require the application of innovative ideas, the introduction of advanced technologies, projects, and management measures are actively developing in the world.

Personnel, the professional, intellectual, creative, and other abilities of which contribute to the development of innovativeness, is the driving force of innovative development. It involves the generation of new knowledge, its transformation into new products and technologies implemented to ensure business effectiveness. The innovativeness of personnel is inseparable from its activity, which is manifested in the intensification of innovation activity – accelerating the introduction of innovations, performing more active work in the implementation of new technologies, creating and using innovative products. Thus, the innovative activity of employees can be

considered the engine of their innovativeness, an accelerator of the innovative development of an enterprise.

Innovative activity is a qualitative characteristic of the innovative behavior of employees in the implementation of their innovation potential. Created innovative products are the result of realizing the innovation potential of the company's personnel and, accordingly, their innovative activity. Under conditions of innovative development of an enterprise, the transformation of objects of the right of intellectual property into an innovative product becomes especially relevant. It is because they are the basis for the creation of innovative products and determine the level of their novelty. Such a transformation is possible on condition of an effective marketing strategy, as far as objects of intellectual property right and technology transfer are concerned.

Thus, the innovativeness of the company's employees depends on their innovation potential, activity in the process of innovation activity, and is expressed in the results – innovative products suitable for commercialization.

The innovativeness of the company's personnel needs to be evaluated using indicators. The study of such indicators

for assessing the level of ideas, concepts, and prospects in the innovative field of an enterprise is important. However, as the experience of the activity of Ukrainian enterprises shows, they do not use these indicators to the full. This is due to two reasons. Firstly, there exist a large number of indicators and methods for their calculation to assess the innovative capacity of the company's personnel. Secondly, it is insufficient awareness of the interconnection of all processes from the beginning of the formation of innovative potential of personnel to ensure specific final results of innovation activity. In this regard, an integrated approach to the formation of the system of innovativeness of the company's personnel and assessment of its level is becoming increasingly relevant.

2. Literature review and problem statement

Innovativeness in paper [1] is defined as “a qualitative concept ..., emphasizing the existence of a new phenomenon, products, technologies, etc., which make it possible to enhance effectiveness”. It is possible to quantify the innovativeness degree by determining its level based on the indicators that characterize the degree of development or implementation of technical, production, organizational, informational, and managerial, and other innovative decisions. Paper [1] does not contain such indicators, although, in fact, they are the indicators, by which one can judge the state of innovativeness of the company's personnel, the ability to increase its level.

Scientists consider the innovativeness of personnel mainly as an innovative potential, so there are not many works, in which the concept of the “innovativeness of personnel” is revealed. In particular, paper [2] provides its interpretation as a tendency of employees to innovation, complex behavior, including generation of ideas, their promotion and implementation to achieve organizational desires. This definition is given from the position of personnel management as for the creation of the necessary conditions, formation of appropriate behavior to realize the innovation potential of employees. However, it does not reveal the whole multi-component of the concept of “personnel innovativeness”, since it includes only the innovative potential of employees and does not take into consideration other components.

There are studies, in which personnel innovativeness is considered from other positions. For example, research [3] focuses on organizational factors of innovativeness, and paper [4] – on psychological ones. Each of the directions is important to assess the innovativeness of the company's personnel and makes it possible to study it in isolation from other factors. However, it is important for enterprises to take into consideration all existing influences, factors, components, parameters of the formation of personnel innovativeness.

The most thorough concept of innovativeness of the company's personnel is revealed in paper [5]. It is defined as the ability of employees to “generate new knowledge, transform it into new technologies, products, competencies, organizational models, ensure their implementation, and increase business costs and competitiveness of an enterprise” [5]. The whole process of creating innovations can be traced in this interpretation: from the generation of an idea to its final implementation. However, the process of transformation of new knowledge into new technologies, organizational models,

etc. requires clarification and specifying. It is the completion of the process through the commercialization of an innovative product that distinguishes the personnel innovativeness from the innovation potential.

International practice makes it possible to consider all sorts of innovation indicators. For example, an objective indicator for evaluation of different countries is Global Innovation Index [6]. The Global Innovation Index technique was devised by the INSEAD Business School, the Cornell University Consortium (USA), and the World Intellectual Property Organization. It has been calculated since 2007 at least for 130 countries (each year the number of countries is different). It is determined based on 80 indicators, which are combined into 7 groups. The results of the evaluation of indicators are two sub-indices. The first sub-index “Innovation Input” has four groups of indicators: institutions, human capital and research, infrastructure, development of the internal market and business. The second sub-index “Innovation Output” has three groups of indicators: development of technologies and knowledge economy, results of creative activity. The total Global Innovation Index is calculated as a cost-effect ratio, which makes it possible to objectively assess the effectiveness of innovation development in each country. In Global Innovation Index, the indicators of intellectual property objects are important, but the indicators of innovation potential of employees are not sufficiently taken into consideration.

Innovation indicators are taken into account as components in determining the Global Competitiveness Index, which was designed by the IMD World Competitiveness Center and is based on 334 criteria indicators of competitiveness [7], among which there are indicators that characterize the innovativeness of employees. IMD World Competitiveness Center is a large and unique base for determining the competitiveness indicators of the countries of the world. It includes temporary ranks from IMD Global Competitiveness Yearbook, from IMD leading annual report, from IMD World Talent Ranking, and IMD Global Digital Competitiveness Ranking. The specific feature of the IMD World Competitiveness procedure is that it combines 2/3 of statistics from 1/3 of survey data obtained as a result of an exclusive survey of business leaders' opinions. It is important to emphasize that this methodology assesses an indicator that takes into consideration the level of talent development and retention for enterprises operating in these countries. It should be noted that innovations and intellectual property objects act simultaneously as tools of innovative development and tools for ensuring the competitive advantages of an enterprise. That is why indicators of innovative development at the micro-level are taken into consideration indirectly, through a survey of companies' directors. This technique is interesting and multicomponent, but quite complex to transfer its essence and content to design a comprehensive approach for evaluating the indicators of innovativeness of the company's personnel.

Indicators of innovative development of an enterprise, innovativeness of its employees are the indicators that are evaluated in dynamics or compared to similar indicators of other enterprises. Thus, in paper [8], indicators of development of technology and innovation are considered as information, statistical data that make it possible to quantify various aspects of technological development and creation of innovations. The study covers fifteen years of empirical analysis and makes it possible to identify problems in the studied

innovative system. However, this analysis is based on macroeconomic indicators, which only partially (indicators of technological development) can be applied to enterprises.

As for modern research, scientific literature contains many methodical approaches to determining innovation indicators under different conditions. Their widest bibliographic analysis throughout the entire innovation process was performed in paper [9]. In it, 82 unique innovation indicators and factors were separated. It was emphasized that in the scientific literature, indicators are not sufficiently taken into consideration at the early stages of the innovation process. The studies have shown a large number of indicators that partially characterize innovation and innovative activity. Among the entire array of the studied indicators, a small number of them, which relates to the issues of this article can be separated. This indicates the lack of solid scientific knowledge in the studied aspect.

A wide overview of indicators of evaluation of the effectiveness of innovation activity of an enterprise, which include the indicators related to innovation-oriented personnel, is given in monograph [10]. However, some of these indicators indirectly or partially characterize the problem under study. Among them, there are specialization and cooperation coefficients, coefficient of activity of patent-licensed case. The reason for limiting the range of indicators may be objective difficulties associated with the complexity of quantitative assessment of qualitative indicators, for example, the desire of employees of an enterprise to carry out innovation activities. An option to overcome such difficulties may be the use of the expert or point-score method for assessing quality characteristics, for example, innovation activity or innovation potential of personnel.

One of the characteristics of innovativeness of the company's personnel is the level of innovative potential of employees. Studies [11, 12] present indicators that make it possible to determine partial and integrated indices for assessing the innovation potential of the company's personnel. They take into consideration intellectual, professional, creative, communicative, organizational and labor, and other areas of development of innovative abilities and capabilities of employees. Some of these indicators are advisable to use in this study.

Considering the assessment of the level of innovativeness of the company's personnel, it is worth focusing on the indicators of evaluating the effectiveness of innovation activities of the company's personnel. It should be noted that scientists pay little attention to the issues of evaluating the effectiveness of innovation activities of the company's personnel. Only some scientists evaluate the effectiveness of the innovation activity of an enterprise. In particular, study [13] revealed a statistically significant positive relationship between enterprise investments in intellectual property and their results. In this case, one group of effectiveness indicators was based on the data on the income growth of enterprises. Another group of indicators of intellectual property objects, namely: patents, trade secrets, trademarks, copyrights, and licenses for technologies, was obtained from external sources. It should be noted that the calculation of indicators of the second group includes not only quantitative indicators of patents for objects of intellectual property rights but also licenses. It is this indicator that characterizes the level of commercialization of objects of intellectual property rights.

Paper [14] presents a methodical approach to determining the effectiveness of the innovation activity of an

enterprise. It is based on the use of the creative potential of employees at different stages of an innovative process of an enterprise. That makes it possible to make management decisions regarding the introduction of innovations, the size of investments in innovation and commercialization of innovations. However, this approach is based on a confidential data set, which makes it impossible to use it for generalization and comparison with other enterprises.

The review of scientific positions showed the importance of assessing the level of innovativeness of personnel under conditions of innovative development of an enterprise using indicators. At the same time, the innovativeness of personnel is considered by scientists in fragments. Most methods of its evaluation are based on indicators that take into consideration certain aspects of the manifestation of innovativeness of employees – the level of innovation potential, psychological or organizational factors, volumes of objects of intellectual property, results of innovation activities, etc. However, there is a gap in the studies that consider indicators for a comprehensive assessment of the innovativeness of personnel due to its innovation potential, innovative activity, and effectiveness. Taking into consideration the above, the urgent issue of a comprehensive assessment of the level of innovativeness of the company's personnel needs to be addressed.

3. The aim and objectives of the study

The aim of the research is to develop a comprehensive approach to assessing the indicators of innovativeness of the company's personnel to determine the prospects for its innovative development.

To achieve this aim, the following tasks were set:

- to propose the concept of forming a comprehensive approach to assessing the innovativeness of the company's personnel;
- to devise a system of indicators for assessing the innovative activity of the company's personnel;
- to devise a system of indicators to evaluate the effectiveness of innovative activities of the company's personnel.

4. The study materials and methods

To create the concept of forming a comprehensive approach to assessing the innovativeness of the company's personnel, the method of logical generalizations was used. Within the framework of the concept, based on determining the causes and consequences, the relationship between the innovation potential of employees, their innovative activity and effectiveness were scientifically substantiated. The methodical approach to calculating Global Innovation Index according to sub-indices "Innovation Input" and "Innovation Output" [6], as well as an understanding of the essence of personnel innovativeness in paper [15], is the basis for the creation of this concept.

To assess the innovativeness of the company's personnel, a comprehensive approach, within which the stages of evaluation were determined using the decomposition method, was proposed.

The main difference between personnel innovativeness and innovation potential is the completion of the process of transforming new knowledge into innovative products and

their further commercialization [5]. This view is taken as the basis for the formation of indicator systems for assessing the innovativeness of the company's personnel.

The methods of grouping and systematization were used to develop the systems of indicators of innovativeness of the company's personnel in terms of assessing the innovation activity of employees and the effectiveness of their innovation activities. It is proposed to assess the level of innovativeness of the company's personnel using the Harrington scale and in a matrix way, taking into consideration the levels of innovation activity and the effectiveness of innovation activities of personnel.

To calculate the level of innovation activity of the company's personnel, we used the qualimetric method, which, based on the binary assessment scale, makes it possible to calculate the corresponding partial and integrated indicators.

To generate the indicators of the effectiveness of innovation activity of employees, we used the method of relative values. The results of study [13] were taken into consideration when designing separate indicators of the effectiveness of the commercialization of innovative products. To match indicators that have different units of measurement, the min-max method was used. When using this method, all values of indicators are normalized from 0 to 1.

The method of weight coefficients was applied to determine the significance of partial indicators of the effectiveness of innovation activity of employees.

5. Results of devising a comprehensive approach to assessing the indicators of innovativeness of the company's personnel

5.1. The concept of formation of a comprehensive approach to assessing the indicators of innovativeness of the company's personnel

Personnel innovativeness in this study takes into consideration the substantive characteristics of innovativeness given in paper [15]. According to them, "innovativeness as an economic category reflects the system of relations between a carrier of innovation and the external environment in relation to the existence of features that characterize the prerequisites and/or results of innovation activity". In addition, innovativeness should be considered as a multi-aspect concept "which combines a rather large number of different parameters of a carrier of innovation related to his readiness to implement and/or the resulting (existing) results of innovation activity" [15]. As it can be seen from this statement, there are two main groups of parameters of innovativeness in relation to the implementation of innovation activity – parameters of readiness and parameters of the obtained (available) results. This shows the expediency of considering indicators of innovativeness of the company's personnel in the following areas:

- assessing their innovation potential as the ability/willingness to show innovation activity using their own innovation abilities and capabilities;
- evaluation of the effectiveness of innovation activities of personnel.

Taking into consideration the above and the fact that personnel is the innovation carrier of an enterprise, the definition of the essence of innovativeness of personnel was proposed. It implies a complex integrated socio-economic category, a qualitative characteristic of the ability of em-

ployees to carry out innovation activity, to ensure effective innovation activities at an enterprise based on the use of their own innovation potential.

The relationship between the components of the formation of innovativeness of the company's personnel is shown in Fig. 1.

Explaining such a relationship, it can be determined that the existence of innovation potential of the company's personnel is the basis for the formation of its innovation activity. It is defined as the ability of employees to apply their own innovative abilities and capabilities in the activities of the enterprise in order to create, manufacture, implement and commercialize innovative products. Thus, the components that form the innovation potential of the company's personnel are innovation abilities and innovation capabilities of employees. Their application is impossible without the desire of employees to carry out innovative activities. Therefore, appropriate conditions-motivators are needed for such a desire to emerge. Together with the innovation potential of the personnel, it can provide innovative activity at an enterprise.

Innovative activity of personnel should be considered as a manifestation of labor activity, as a dynamic characteristic of the intensity of innovation activity of employees of an enterprise, as the driving force for ensuring its sustainable innovative development. Innovation activity of employees determines the specific features of the innovation process, the dynamics of the innovation activity of an enterprise, its goals, motives, orientation, etc. The level of innovation activity of employees is an indicator of the state of innovation activity, which can be represented at three stages – creation, production, implementation, and commercialization of innovations. At each stage, employees of an enterprise involved in the innovation process can show their innovative activity of different intensity. The effectiveness of its innovative activity depends on the level of innovation activity of the personnel. In this study, it is considered to be a qualitative characteristic of the degree of achievement of the goals of innovative activity of an enterprise as for the creation of innovative products in comparison with the consumed efforts of the personnel.

The results of the intellectual activity of innovatively active personnel of an enterprise are intellectual resources that can be identified. In most cases, those intellectual resources that have commercial potential, receive legal protection or are kept in commercial secrecy (know-how). The criterion for acquiring intellectual property rights is their commercial potential and commercial suitability. Thus, an innovative product is an object of intellectual property or a package of objects of intellectual property rights that are ready for commercialization or for introduction into production. Objects of intellectual property rights are usually commercialized by concluding license agreements or by full transfer of property rights. An enterprise should receive economic, social or any other effects from the introduction of innovative products in its own production. Besides, an enterprise can receive additional income in the form of royalties from know-how and patents under licensing agreements from the sale of innovative products.

Thus, it has been proved that the innovativeness of the company's personnel can be considered through the study of the innovation activity of employees and the effectiveness of their innovation activities. The level of innovativeness of the company's personnel requires assessment, which is proposed to be carried out with the help of appropriate indicators of innovation activity and effectiveness.

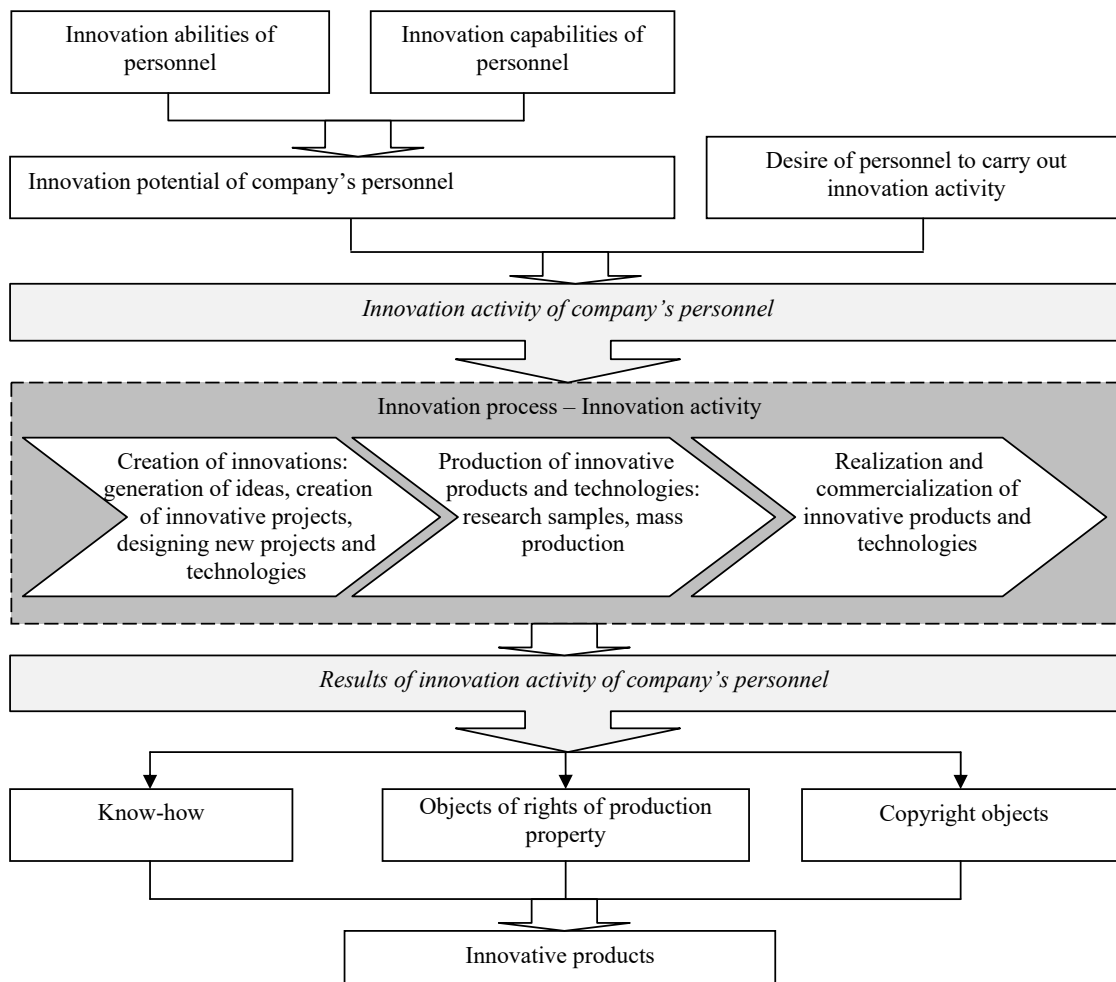


Fig. 1. Relationship between the components of formation of innovativeness of company's personnel

It is proposed to assess the level of innovativeness of the company's personnel according to partial, integrated, and generalizing indicators. Partial indicators characterize separate parameters-components of innovativeness of the company's personnel. Integrated indicators are the levels of innovation activity of employees and the effectiveness of their innovation activities. The generalizing indicator is the level of innovativeness of the company's personnel. Collectively, the above indicators form the corresponding systems, and their definition will be discussed further in this study.

To assess the innovativeness of the company's personnel, we proposed a comprehensive approach (Fig. 2).

This approach makes it possible to determine the level of personnel innovativeness and in accordance with it to establish the opportunities for further innovative development of an enterprise.

Within the framework of determining the criteria for assessing the innovativeness of the company's personnel (Stage 1 in Fig. 2), it is proposed to apply:

- maximization criteria – the innovative activity of employees and effectiveness of their innovation activities should be maximum;
- criteria for compliance with the target parameters – innovation activity of employees and effectiveness of their innovation activities must meet the target, planned or normatively established criteria at an enterprise.

Devising the indicator systems, their calculation and specific features of evaluation (Stages 2–4 in Fig. 2) will be discussed in detail below. It is proposed to calculate the generalizing indicator of innovativeness of the company's personnel in accordance with Stage 5 of the comprehensive approach according to the formula:

$$I = \sqrt{IA \cdot PI}, \tag{1}$$

where *IA* is the integrated indicator of innovation activity of company's personnel; *PI* is the integrated indicator of the effectiveness of innovation activity of the company's personnel.

At Stage 6 of assessing the level of innovativeness of the company's personnel, it is proposed to use two approaches:

1) According to the Harrington scale, determine the approaching of the level of innovativeness of the company's personnel to the maximum that is equal to 1. In this case, a very low level (0–0.2), a low level (0.2–0.37), a medium level (0.37–0.63), a high level (0.63–0.8), a super-high level (0.8–1).

2) Based on a similar assessment of the levels of innovation activity of personnel and effectiveness of its innovation activities according to the Harrington scale, form an evaluation matrix of the level of personnel innovativeness (Fig. 3).

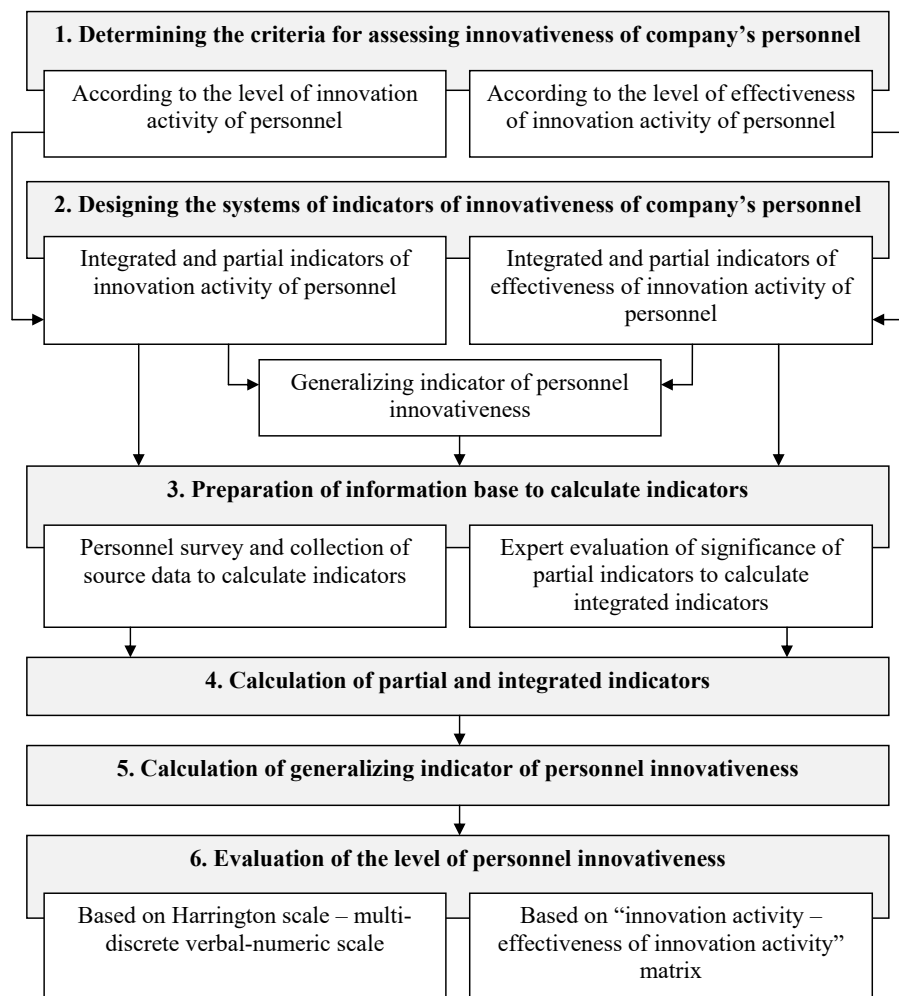


Fig. 2. The proposed comprehensive approach to assessing the innovativeness of the company’s personnel

		Levels of effectiveness of innovation activity of company’s personnel		
		Low (0-0,37)	Medium (0,37-0,63)	High (0,63-1)
Levels of innovation activity of company’s personnel	Low (0-0,37)	Low level of personnel innovativeness	Ineffective involvement of innovatively active personnel of a company	
	Medium (0,37-0,63)	Ineffective efforts innovatively active personnel	Medium level of personnel innovativeness	
	High (0,63-1)			High level of personnel innovativeness

Fig. 3. Evaluation matrix of the level of innovativeness of the company’s personnel

The determined level of personnel innovativeness can become the basis for making management decisions on further innovation development of an enterprise in the long term.

5.2. Results of devising a system of indicators for assessing the innovation activity of the company’s personnel

Devising an integrated approach to assessing the innovativeness of the company’s personnel includes the formation of a system of indicators of innovation activity of employees.

It was determined that it is interrelated and is based on the assessment of the innovation potential of personnel and its desire to carry out innovation activities. A high level of innovation potential of personnel is necessary for effective innovation activity at an enterprise and is achieved through the development of innovative abilities and deepening innovation opportunities. The range of innovation abilities and capabilities of employees is wide enough. Separating natural, organizational, and labor, intellectual, creative, and other abilities and capabilities of employees, it is possible to determine the areas of development of innovation potential of personnel that need priority attention. To do this, it is necessary to use a system of appropriate indicators.

No doubt, the developed innovation abilities of employees and favorable circumstances and conditions for their implementation (innovation capabilities) ensure the growth of innovation potential of the company’s personnel. However, it may not be used if employees do not want to carry out innovation activities. Consequently, there is a need to determine if such a desire exists and to establish its level. The appropriate indicators are also used for this purpose. The existence of innovation potential of personnel, its desire to carry out innovation activities taken together form the level of innovation activity of employees at an enterprise. It can be considered an integrated indicator, formed from partial indicators.

For example, in this study, it is proposed to include partial indicators of innovation abilities, innovative capabilities, and the desire to carry out innovation activities in the system of indicators of innovation activity of personnel. Partial indicators of innovation

abilities and capabilities of employees are determined based on separate abilities and capabilities that form the natural, intellectual, creative, organizational and labor, and other components of the innovation potential of the company’s personnel. This system of indicators makes it possible to comprehensively assess the level of innovation activity and innovation potential of employees.

Article [16] proposed a qualimetric procedure to assess the innovation potential of the company’s personnel, in which its integrated level is calculated based on the assess-

ment of indicators of total innovation abilities and total innovation capabilities of employees:

$$IP_{IPP} = \sqrt{Z \cdot M}, \tag{2}$$

where Z is the indicators of total innovation abilities of the company’s personnel; M is the indicators of total innovation capabilities of the company’s personnel.

In turn, these indicators are determined taking into consideration the significance of separate innovation abilities and capabilities of the company’s personnel in the characteristic of Z and M . Within the assessment of indicators of innovation activity of employees, a slightly different way of determining innovation abilities and capabilities than the one given in the article was proposed [16]. It can be simplified without taking into consideration the specific structure of the innovation potential of the company’s personnel. In addition, the proposed approach improves the existing one because it takes into consideration and makes it possible to quantify the desire of employees to carry out innovation activities. Moreover, this approach determines a new indicator – an integrated indicator of innovation activity of personnel, which is defined as a triad of partial indicators of innovation abilities, innovation capabilities, and the desire of personnel to carry out innovation activities.

Thus, it is proposed to determine partial indicators of total innovation abilities (Z) and capabilities (M) of employees as follows:

$$Z = \sum_{p=1}^P \left(\sum_{i=1}^n z_i \cdot d_i \right) / P, \tag{3}$$

$$M = \sum_{p=1}^P \left(\sum_{j=1}^k m_j \cdot d_j \right) / P, \tag{4}$$

where z_i is the indicator of the i -th innovation ability of an employee ($i=1, n$); d_i is the significance of the i -th innovation ability of an employee ($\sum d_i=1$); m_j is the indicator of the j -th innovation capability of an employee ($j=1, k$); d_j is the significance of the j -th innovation capability of an employee ($\sum d_j=1$); P is the number of personnel ($p=1; P$).

Since most of the innovative abilities and capabilities of employees are difficult to quantify, it is proposed to apply qualimetric evaluation methods, for example, expert evaluation, to calculate partial indicators that characterize them. At the same time, the easiest way is to use a binary scale, where 0 – there are no certain innovative abilities and capabilities, 1 – there are certain innovative abilities and capabilities. For example, if there are creative abilities, expert evaluation is 1, if there is no motivation to produce innovations, expert evaluation is 0.

It is possible to separate the following most characteristic indicators to assess single (i -th) innovation abilities and single (j -th) capabilities of employees that can be used to calculate partial indicators.

Indicators of the i -th innovation abilities of employees:

- depth, width, independence, and criticality of thinking;
- thirst for innovative knowledge, tendency to study and self-study;
- ability to logical, operational, and analytical thinking;
- tendency to creativity, generation of ideas;
- ability to communicate in a team in the preparation and implementation of innovative projects;

- abilities to adapt to new, stressful, and unpredictable conditions during the innovation process;
- entrepreneurial abilities and propensity for risk when making decisions at all stages of the innovation process.

Indicators of the j -th innovation capabilities of employees:

- availability of investments for the development of innovation abilities;
- material and moral motivation of innovative activity of employees of an enterprise;
- access to the innovative information;
- organization of working and recreational conditions that contribute to the development of innovation activity of employees;
- formation of organizational structures that contribute to effective work on innovative projects;
- favorable climate in the labor force, communication, social and labor relations that contribute to innovative development.

Assessing the desire of employees to carry out innovation activities, it is also advisable to apply expert assessment. At the same time, it is important to take into consideration the probable (expected) attitude of the company’s personnel to the introduction of innovations, the inertia of innovation behavior of employees [17].

Needless to say, not all employees of an enterprise want to carry out active innovation activities, some may be indifferent, and some even resist (in an active or inert way). The experience of cooperation with some Ukrainian enterprises showed that they used either specially organized observation at the request of employees to carry out innovation activities, or self-evaluation by employees themselves in the form of questionnaires. According to their results, a partial indicator of the desire to carry out innovation activity was determined:

$$B = \sum_{p=1}^P \left(\sum_{r=1}^R b_r \cdot d_r \right) / P, \tag{5}$$

where z_i is the indicator of the r -th characteristic of an employee’s desire to carry out innovation activity ($r=1, R$); d_r is the significance of the r -th characteristic of an employee’s desire to carry out innovation activity ($\sum d_r=1$).

The proposed partial indicators of the innovation potential of personnel and its desire to carry out innovation activities taken together form an integrated indicator of innovation activity of the company’s personnel. The following approach is proposed to determine it:

$$IA = \sqrt[3]{Z \cdot M \cdot B}. \tag{6}$$

Thus, the application of the system of integrated and partial indicators of innovation activity of personnel makes it possible to comprehensively evaluate its innovativeness, as well as the prospects for further innovative development of an enterprise.

5.3. Results of devising a system of indicators to assess the effectiveness of innovation activity of the company’s personnel

The essence of innovative development of an enterprise and its components are comprehensively revealed in paper [18], which makes it possible to determine the place of innovative products in the system of management of the results of innovation activities of the company’s personnel.

The creation of innovative products is implemented in the innovative process of an enterprise stage by stage (Fig. 1). At Stage 1, the needs of consumers to create a new product, or problems of their own production, which require new solutions, are studied. This is an important stage at which it is necessary not only to determine the need to create a new product but also to determine the possibility of its further commercialization. This approach is based on open innovations and on the possibility of selling licenses for intellectual property rights or know-how belonging to an enterprise. Study [19] examines how adopting an open innovation strategy changes a business model, especially for small and medium-sized enterprises. The result of their research suggests that the implementation of the open innovation strategy helps enterprises to focus on their strengths and fortify them, as well as makes it possible to adapt to market requirements.

At Stage 2 (Fig. 1), teams of experienced specialists of an enterprise and authors of innovative ideas are formed to implement innovative projects. It is better to entrust the management of innovative projects to experienced managers of innovative projects. Well-known business schools offer training packages for such specialists, which take into consideration the best world experience in the implementation of innovative projects. The implementation of this stage will be successful if the strategy of intellectual property management is combined with the overall corporate strategy. Intellectual property is implemented and used in many countries as a global standard. In paper [20], it is noted that the practical use of the global standard on the intellectual property indicator has not yet matured due to the lack of an appropriate strategy. The author emphasizes that each enterprise should determine its unique intellectual property strategy and differ from other enterprises since the external environment and internal resources are different. Study [20] indicates two main aspects. The first aspect is the employees involved in the creation of intellectual property. The second important aspect is the strategy of intellectual property management, which should include expert examination based on laws of intellectual property and relevant regulations.

Important Stage 3 is the commercialization of innovative products through the marketing of innovations and marketing of rights intellectual property, where intellectual property objects are offered as a commodity, and the sale takes place through the complete transfer of property rights, the conclusion of license agreements on know-how or intellectual property objects in order to obtain royalties. Patent marketing can significantly increase the cost of patenting or patent portfolios. Study [21] emphasized that a business model is a central building block for integrated marketing communication of intellectual property. However, it should be noted that the market, rather than the technical complexity of innovations, leads to success.

To develop a comprehensive approach to assessing the innovativeness of employees of an enterprise, it is necessary to form a system of indicators of the effectiveness of their innovation activities. Indicators of effectiveness are determined based on the identification of the results of innovative activity in the financial reporting of an enterprise. Most objects of intellectual property are reflected in intangible assets of an enterprise.

Research [22, 23] proposed a number of clarifications of the interpretations of the concept of "intangible assets" in

various normative and legislative acts of Ukraine, which combine economic, accounting, legal, and evaluation aspects.

For example, in Ukraine, the composition of rights for intellectual property is regulated by the Civil Code of Ukraine (Article 420) [24]. However, it should be noted that most of these objects of intellectual property belong to objects of intangible assets and are regulated by the Accounting Regulation (P(C)BO No. 8 [25]. Internationally, intangible assets are regulated by International Financial Reporting Standards (IFRS) No. 38 [26].

Most intellectual property objects are reflected in the financial statements of an enterprise both in national reporting forms and in international standards. This approach makes it possible to clearly identify, keep records, make assessments, as well as sell objects of intellectual property as goods or receive royalties by concluding license agreements. However, there are certain problems of coherence of national and international financial reporting standards. If we do not take into consideration these discrepancies, this situation can lead to distortion of information in statistical reports and analysis results, respectively. Therefore, it is proposed, using the example of Ukraine, to compare national and international normative documents regulating objects of intellectual property, royalties, know-how, etc. This is extremely important since royalties from the conclusion of license agreements for intellectual property can be a source of additional income. According to the Tax Code of Ukraine, royalties are recognized as passive income (p. 14.1.268 p. 14.1. Art. 14) [27].

In Accounting Regulation No. 8, there is no clear definition of the know-how and its composition.

In Ukrainian accounting standards, royalties are reflected in Accounting Regulation No. 15 [28]. That is, royalties are defined as other operating income (unless royalties are related to the main activity).

The fundamental difference between the national standards of Ukraine and international standards is as follows. International financial reporting standards No. 38 contain: (d) client contracts; customer lists; (e) licenses; royalties; license agreements; franchising agreements; employment contracts, etc. Such objects of intangible assets are absent in Accounting Regulation No. 8.

In the case when a company does not patent inventions but keeps them in the mode of trade secrets, the implementation of know-how involves the complication of a license agreement. Thus, the company can choose between two modes of protection of inventions: the mode of acquisition of intellectual property rights and further legal protection or the mode of trade secrets. It should be noted that the know-how can also be sold, license agreements are concluded in order to obtain royalties, etc. Both modes of protection of inventions have their advantages and disadvantages, so a reasonable choice of protection mode must be agreed with the general strategy of enterprise development in order to make effective managerial decisions.

Given the described problems, a system of indicators of the effectiveness of innovation activity of the company's personnel, based on financial statements and open sources, was proposed. The purpose of evaluating the effectiveness of personnel innovation activities is to evaluate specific final results for the development and planning of strategic alternatives to the management of innovative development by innovatively active personnel and intellectual property of an enterprise. The effectiveness of innovative activity of

personnel is evaluated using 12 partial indicators, which form two groups. The first group of 6 partial indicators characterizes the effectiveness of innovative activity of the company’s personnel. The second group of 6 partial indicators characterizes the effectiveness of commercialization of innovative products. In totality, based on the calculation of these partial indicators, we determine the integrated indicator of the effectiveness of innovative activity of the personnel of an enterprise, which is an important parameter of the level of innovativeness of personnel.

The system of partial indicators of the effectiveness of innovation activity of the company’s personnel is given in Table 1.

To calculate the integrated indicator of the effectiveness of innovation activity of the company’s personnel, all partial indicators must be brought into a comparable form.

To match indicators I1–I12, having different units of measurement, we use the well-known minimax method, by which all partial indicators are brought to a normalized form. As a result of using this method, they will be in the range from 0 to 1. Since indicators I1–I12 have different

significance for assessing the effectiveness of innovative activities of personnel, their normalized values are weighted by the corresponding coefficients. Similarly, the group significance of partial indicators is taken into consideration.

Thus, it is proposed to determine the integrated indicator of the effectiveness of innovative activities of the company’s personnel (PI) from the following formula:

$$PI = \sum_{f=1}^F \left(\left(\sum_{s=1}^S \frac{I_s - I_{\max s}}{I_{\max s} - I_{\min s}} \cdot \omega_s \right) \cdot \omega_f \right), \tag{7}$$

where I_s is the s -th partial indicator of the effectiveness of innovative activity of the personnel of the f -th group of partial indicators ($s=1, S; f=1, F$); $I_{\max s}, I_{\min s}$ are the maximum and minimum normalized values of the s -th partial indicator; ω_s is the significance of the s -th partial indicator of the effectiveness of innovative activity of the personnel of the f -th group ($\sum \omega_s=1$); ω_f is the significance of the f -th group of partial indicators ($\sum \omega_f=1$).

Table 1

System of partial indicators of the effectiveness of innovation activity of the company’s personnel

Indicators	Formula of calculation	Weight of indicator in a group
Group of indicators of the effectiveness of innovative activity of personnel (the weight of a group of indicators in the integrated indicator is 0.4)		
I1 – Indicator of patent activity of personnel according to the national procedure, where P_t is the number of applications for OPIV under the national procedure, t is the research period (year, quarter, month)	$I_1 = \frac{P_t}{P_{t-1}} \cdot 100 - 100$	0.15
I2 – Indicator of patent activity of personnel according to the international procedure, where PCT_t is the number of submitted applications for OPIV under the international procedure (RCT)	$I_2 = \frac{PCT_t}{PCT_{t-1}} \cdot 100 - 100$	0.15
I3 – Indicator of the result of the patent activity of personnel according to the national procedure, where OP_t is the number of received security documents for OPIV under the national procedure	$I_3 = O \frac{OP_t}{P_{t-1}} \cdot 100 - 100$	0.2
I4 – Indicator of the result of the patent activity of personnel according to the international procedure, where $OPCT_t$ is the number of received security documents for OPIV under the international procedure	$I_4 = \frac{OPCT_t}{OPCT_{t-1}} \cdot 100 - 100$	0.2
I5 – Indicator of inventive activity of personnel, where NH_t is the number of identified, taken on balance and implemented at the enterprise know-how	$I_5 = \frac{NH_t}{NH_{t-1}} \cdot 100 - 100$	0.15
I6 – Indicator of an increase in the number of innovatively active personnel, where IAP_t is the number of employees who are the authors of OPIV, the know-how and/or participated in an innovative project	$I_6 = \frac{IAP_t}{IAP_{t-1}} \cdot 100 - 100$	0.15
Group of indicators of the effectiveness of commercialization of innovative products (the weight of a group of indicators in the integrated indicator is 0.6)		
I7 – Indicator of the ratio of the number of concluded license agreements on OPIV and know-how (LD_t) and the total number of operating OPIV (DP_t) and know-how (DNH_t) at an enterprise, %	$I_7 = \frac{LD_t}{DP_t + DNH_t} \cdot 100 \%$	0.15
I8 – Indicator of specific weight of innovative products (IP_t), % in the total volume of sold products (RP_t), %	$I_8 = \frac{IP_t}{RP_t} \cdot 100 \%$	0.2
I9 – Indicator of specific weight of royalties (R_t) in the income of an enterprise (D_t), %	$I_9 = \frac{R_t}{D_t} \cdot 100 \%$	0.2
I10 – Indicator of specific weight of costs for CNDR ($CNDR_t$) in costs of an enterprise (C_t), %	$I_{10} = \frac{CNDR_t}{C_t} \cdot 100 \%$	0.15
I11 – Indicator of successful innovation projects, where InP_t are innovative projects that have been successfully implemented at an enterprise and can be offered to other enterprises	$I_{11} = \frac{InP_t}{InP_{t-1}} \cdot 100 \%$	0.15
I12 – Indicator of the effectiveness of innovative activity of an enterprise, where RIP_t is the profitability of implemented innovative products	$I_{12} = \frac{RIP_t}{RIP_{t-1}} \cdot 100 \%$	0.15

The indicators are intended for:

- objective reflection of the effectiveness of innovative activity of the company's personnel and effectiveness of commercialization of innovative products;
- serving a tool for interaction with stakeholders (authors of inventions, managers of innovative projects, partners, consumers, investors, etc.);
- helping managers of enterprises to have a systemic and adequate idea of the effectiveness of innovative activities of personnel;
- helping to improve the system of management of innovative development of an enterprise, as well as to increase the effectiveness of monitoring, control, and evaluation of the results of innovative activities of personnel;
- making it possible to identify strengths and weaknesses in each of the two directions of assessing the results of innovative activities of the company's personnel.

6. Discussion of the proposed comprehensive approach to the assessment of indicators of innovativeness of the company's personnel

Devising an integrated approach to assessing the indicators of innovativeness of the company's personnel is based on the idea of their research, which takes into consideration the relationship of the innovative potential of employees, their innovative activity and effectiveness (Fig. 1), reveals interdependence and mutual influences.

The proposed comprehensive approach to assessing the innovativeness of the company's personnel (Fig. 2) is represented by six stages, which include determining the evaluation criteria, designing systems of relevant partial, integrated, and generalizing indicators, etc. This approach makes it possible to determine the level of innovativeness of the company's personnel based on the system of indicators of innovative activity of employees and the system of indicators of the effectiveness of their innovative activity. The system of indicators for calculating the innovative activity of personnel is designed based on the qualimetric assessment of their innovative potential – formulas (2) to (6). Evaluation of the effectiveness of innovation activity of the personnel is represented by 12 indicators (Table 1), which will make it possible to assess specific final results for designing and planning strategic alternatives of management of innovative development of an enterprise. Calculation of the generalizing indicator of innovativeness of personnel (Stage 5 in Fig. 2; formula (1)) and Harrington scale (Fig. 3) makes it possible to assess the level of innovativeness of the company's personnel.

The devised integrated approach to assessing the indicators of innovativeness of the company's personnel differs from those discussed in this study [8–16] by the fact that:

- firstly, it considers the innovativeness of the company's personnel by determining their innovation activity and the effectiveness of innovation activity;
- secondly, it combines two systems of indicators at the same time: integrated and partial indicators of innovative activity of personnel; integrated and partial indicators of the effectiveness of innovative activity of personnel.

The use of the designed system of indicators of innovativeness of the company's personnel is most suitable for those enterprises that switched to an innovative type of development. Such enterprises have a sufficient number of

innovatively active employees. For enterprises that function following the cost reduction strategies, the restriction may be the financing of innovation activities. For small enterprises, an insufficient number of innovatively active employees can act as a restriction.

In addition, the insufficient information base for assessing the innovative potential of personnel and its innovative activity can be considered a restriction. To determine the relevant indicators, it is necessary to organize a special statistical observation in the form of surveys or questionnaires of employees of enterprises and experts.

The main drawback faced in the process of designing a system of indicators for assessing the effectiveness of innovation activity of the company's personnel is the discrepancies between national and international legislation. This is especially relevant for accounting for licenses, royalties, license agreements, etc., since these are the main directions of commercialization of innovative products, technology transfer and, accordingly, new permanent sources of income of an enterprise. Moreover, the national legislation of Ukraine, as an example, complicates the understanding of intangible assets as potential assets with a high level of liquidity. That is why it is important to bring the norms of the national legislation of a country (any country where there are discrepancies) to international norms.

It is appropriate to deepen the study in the direction of management of innovativeness of the company's personnel. Further research should be directed to designing a strategy for the management of innovative potential and intellectual property at an enterprise. This will harmoniously complement the designed system of indicators of innovative development of an enterprise.

7. Conclusions

1. The conducted research made it possible to expand the modern concept of evaluating the innovativeness of the company's personnel through the study of two aspects: assessment of the innovative activity of employees and the effectiveness of their innovation activities. A comprehensive approach to the assessment of indicators of innovativeness of the company's personnel was proposed. Special attention should be paid to the designed systems for assessing the innovative activity of employees and the effectiveness of their innovation activities according to partial, integrated, and generalizing indicators. This approach makes it possible to assess the degree of expediency/effectiveness of attracting innovatively active personnel to innovative activities. Unlike the existing ones, this approach is comprehensive and systemic, since it enables assessing the level of innovative activity and innovative potential of the company's personnel in combination with the effectiveness of its innovation activities. The results of the assessment of the level of innovativeness of personnel are the basis for the development and planning of strategic alternatives to the management of innovative development of an enterprise.

2. It was established that the innovative development of an enterprise depends on the innovativeness of employees, their innovative activity. It was determined that it is possible to ensure the growth of innovative activity of employees by developing their innovative abilities and capabilities, which taken together constitute the innovative potential of the company's personnel. In addition, the innovative activity of

employees depends on their desire to carry out innovative activities. Thus, we can say that the innovative development of an enterprise directly depends on the innovative activity of its staff. To evaluate such activity, a system of partial and integrated indicators was developed. To evaluate the indicators of innovative activity of the company's employees, the qualimetric methodology for assessing their innovative potential was improved by introducing indicators of the desire to carry out innovative activities. This makes it possible to calculate partial and integrated indicators, to assess the level of innovative activity of both an individual employee, and the personnel of an enterprise in general.

3. A system of indicators for evaluating the effectiveness of innovative activities of the company's personnel

was devised. It will provide an opportunity to objectively evaluate the effectiveness of innovative activity of the company's personnel and the effectiveness of commercialization of innovative products with the help of 12 partial indicators. Unlike the existing ones, the designed system takes into consideration not only the effectiveness of innovative activity of personnel but also specific final results of its innovation activities and is based on the financial reporting of enterprises and free sources. This will allow enhancing the effectiveness of monitoring, control, and evaluation of the effectiveness of innovative activities of personnel, as well as improving the systems of management of personnel innovativeness and intellectual property of an enterprise.

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