

MAKING OPTIMAL DECISIONS BASED ON THE DEVELOPMENT OF THE INNOVATIVE POTENTIAL OF PERSONNEL

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ABSTRACT

In order to effectively develop enterprises to ensure the adoption of optimal decisions, a theoretical and methodological approach has been developed to assess the components of the innovative potential of personnel, which are decisive for making optimal decisions based on the «tree of opportunities» and the integral indicator of the innovative potential of personnel, contains complex indicators for assessing innovative activity personnel, innovative development of the enterprise, the degree of development of the enterprise.

Based on the process-analytical generalization, an algorithm for making optimal decisions based on the development of the innovative potential of personnel has been developed, namely: identifying the problems of enterprise development; search for the reasons for the retardation of the development of the enterprise; determination of the reasons for the retardation of the development of the enterprise; determination of optimal solutions depending on the formulated problem; development of recommendations for achieving strategic goals, based on the construction of a «tree of opportunities».

To solve the tasks and test the initial assumptions, a set of methods was used that reflect the unity of the theoretical and empirical levels of knowledge. Theoretical: methods of scientific analysis and generalization of experience in making managerial decisions, comparative method, modeling method; empirical methods: experiment, testing, questioning, content analysis, expert assessments, as well as mathematical and statistical methods for processing experimental data using the SPSS application package and logical and mathematical modeling using the construction of Euler circles.

KEYWORDS

Making optimal decisions, innovative potential of personnel, «Tree of Opportunities».

8.1 INITIAL PROVISIONS FOR MAKING OPTIMAL DECISIONS BASED ON THE DEVELOPMENT OF THE INNOVATIVE POTENTIAL OF PERSONNEL

The search for new ways of enterprise development, along with the growing dynamism of the environment, urgently requires constant improvement of existing forms and methods of management, as well as the development of fundamentally new approaches to management, adequate to new realities.

Improvement of management at all levels is a huge and still insufficiently demanded reserve of effective activity of the enterprise. Against this background, the adoption of optimal managerial decisions based on the development of the innovative potential of personnel is actualized. That is why, on the basis of the process-analytical generalization, an algorithm for making optimal decisions based on the development of the innovative potential of personnel is proposed, namely: determining the problems of enterprise development; search for the reasons for the retardation of the development of the enterprise; determination of the reasons for the retardation of the development of the enterprise; determination of optimal solutions depending on the formulated problem; development of recommendations for achieving strategic goals, based on the construction of «Opportunity Trees».

The aim of research is to develop conceptual provisions and methodological proposals for making optimal decisions based on the innovative potential of personnel, based on the latest trends in the development of the domestic and world economies, as well as management theory.

One of the most urgent for all business entities is the problem of studying the possibilities of survival in the context of the global economic crisis. A review of data from economic periodicals shows that crisis situations are becoming more frequent, and their consequences are gaining greater proportions. In this context, enterprises should wash themselves to adapt to changes in the external environment, and internal controllable factors should determine the ability of business entities to adapt. Considering not this, the role played by managerial decisions in the management system and the activities of the enterprise can hardly be overestimated, since balanced and rational decisions are able to become the starting point for overcoming a crisis situation. Under such conditions, the role in the development of the innovative potential of personnel significantly increases, on whose decision the construction of an optimal strategic future in difficult and unfavorable conditions depends, or in general, depriving the enterprise of the prospects for overcoming the crisis.

Therefore, we consider it appropriate, within the framework of this study, to clarify the concept of «innovative potential» in general and, in particular, personnel. The need to substantiate this concept within the framework of the definition of personnel is primarily due to the fact that when making optimal decisions on the development of enterprises and their management, which, from our point of view, should be associated with innovative potential, this category is not given due attention and the appropriate regulations, namely: in the formation of the structure of economic potential [1]; when disclosing the value of innovative technologies, researching innovative activity, substantiating innovative blocks of enterprises [2]; when looking for ways to form the potential of an enterprise, management and development using innovative resources [3]; when recognized among the components of the development potential of the enterprise innovative, but without its characteristics [4]; when forming a strategy for managing the economic potential of an enterprise [5]; when revealing the essence of the enterprise's potential and its structure [6]; when substantiating the theoretical foundations of innovation policy [7] and modern approaches to the management of innovation processes at trade enterprises [7]; when disclosing the essence of innovative activities of enterprises [8] and the formation of methodological foundations for managing the effectiveness of innovative activities on them [8].

We believe that in solving these problems by scientists, it would be necessary to pay attention to the innovative potential of personnel and determine their role in the described processes. Unfortunately, however, this important category has been ignored.

Therefore, taking into account the above scientific problems, he considers it appropriate to present the definition of «innovative potential» and «innovative potential of personnel». At the same time, proceeding from the natural signs of the development of the enterprise, the condition is accepted that the general potential must be formed at the enterprise. This determines the presence of driving forces (in particular, educated, qualified and creative personnel capable of introducing innovations, and it (potential) must be realized provided there is a sufficient number of driving forces; the effectiveness of its (potential) implementation allows to obtain the desired result of enterprise development.

Proceeding from the disclosed essence of potential as «the aggregate of available means and possibilities...» [9], «a complex economic system...» [10], «aggregate of factors...» [11] or «the internal capacity of the system...» [12], to substantiate the innovative potential, it is advisable to choose the first and last essential characteristics of the potential.

Taking into account these natural features and essential characteristics of potential, and proceeding from the need to eliminate the contradictions established when disclosing the essence of innovation potential and its definitions, we present the following definition: «innovation potential is the internal capabilities of the «enterprise» system to introduce innovations in order to form and implement the potential of the enterprise to ensure intensive development through the generation of knowledge and the commercialization of personnel ideas».

In turn, no less problematic, as it was established above, is the understanding by scientists of the innovative potential of personnel. The concept of «innovative potential of personnel» is most clearly substantiated by such scientists as Dziubina, A. V. [13] and Krasnokutskaya, N. V. [14]. Revealing the essence of the innovative activity of the enterprise, Dziubina, A. V. singles out the personnel component in it together with others and operates with two terms («personnel component» and «human potential») to determine the important place of personnel in the innovative potential of the enterprise [13]. In turn, Krasnokutskaya, N. V., when disclosing the essence of innovation potential, notes that «...the innovation potential is based on personnel and material and technical components... It is especially important to have personnel... providing the innovation process with new knowledge, ideas, inventions, know-how, new technologies. It is to this component of the innovative potential that the main attention should be paid in the strategy of its support, development and restructuring» [14]. The scientist operates with the term «creative potential» and uses it in relation not to the personnel of the enterprise as a whole, but in relation to certain categories – «...researchers have a critical mass of ideas that provides a viable new technical solution...», and «...specialists committed to innovations... have a certain level of scientific and technical competence of creative activity and possess the methods of innovative management...» [14]. The use of two terms («personnel components» and «human resources») can be considered debatable. In the first case [13], and limiting the categories of personnel to researchers and specialists when

using the term «creativity» – in the second [14]. We believe that the use of any of these terms does not fully correspond to the role of personnel in the formation and implementation of innovative potential, thanks to which the development of enterprises takes place.

The importance of the innovative component in the process of personnel potential formation is highlighted by individual economists when revealing the foundations of personnel potential formation. In particular, Lukianchenko, N. D., Antoniuk, V. P., Shaulska, L. V., Shamilo, L. L. in their research, the very process of formation of labor potential at the enterprise characterizes as «...the acquisition of features by a person, necessary for use in labor, obtaining certain knowledge and skills, physical, emotional, spiritual and professional development» [15]. At the same time, they put this process in direct dependence on «...educational and professional training» [15], as well as the influence of such factors as «...scientific and technological progress, innovative processes... the need to introduce new technologies...» [15].

In turn, Shcherbak, V. H. considering the process of formation of labor potential as «...taken in their unity methods, procedures, methods of influencing the employees of the enterprise in order to use their potential to achieve the strategic and tactical goals of the enterprise» – on the one hand and as «...the function of the enterprise aimed at ensuring an effective and continuous balance between the availability of employees and the needs for them in terms of number and qualifications...» [16] – on the other hand, draws attention to its ability to introduce innovations and determines labor potential (staff – author) as «...a powerful factor of socio-economic development» [16].

Such reasoning confirms that the innovative potential of personnel is an integral part of the overall potential of personnel (or – «labor potential»). The innovative component in the very process of forming the potential of the personnel of the enterprise is also observed in the evolutionary aspect of the development of scientific schools [17, 18–20].

So, Vihanskiy, O. S., Naumov, A. I. and Walker, J. W. identified among the basic principles a clear division between mental and manual labor, between low- and medium-skilled labor and the need for managers to apply a scientific approach in the process of building personnel potential [19, 20].

Pul, M., Uorner, M. drew attention to encouraging the personnel of the enterprise to introduce innovations in production to improve product quality and improve the organizational structure, highlighted such a necessary feature in the process of building personnel potential as the need to improve the professionalization of workers, paid special attention to the process development of personnel in order to ensure its ability to introduce innovations [21].

Mincer, J. drew attention to the practice of managers using such approaches as encouraging and encouraging each employee to fully realize their capabilities to achieve the business goal, for which the practice of training and raising the level of education of personnel was introduced without fail [22].

Hence, it becomes obvious that in the evolutionary aspect, the process of building personnel potential is focused on their ability to introduce innovations, is associated with the need to im-

prove skills and use by managers scientific approaches in personnel management [19, 20], the development of personnel motivation to improve product quality (and improve the organizational structure, the development of professionalism [18], stimulation to increase the level of education [22]). The listed aspects of the process of formation of personnel potential with its focus on innovation are characteristic of enterprises of any industry. The process can be recognized as the primary basis for the formation of the innovative potential of the enterprise as a whole. The tagline goal of the formation of other innovative potential of personnel is to ensure precisely this type of development.

The most convincing studies of Krasnokutskaya, N. V. according to which, for the formation of the innovative potential of the enterprise, the potential of innovation management is important (i.e. the ability of managers to master innovations in their work activities – author) and the personnel that provide the innovation process at the enterprise with new knowledge, ideas, technologies, inventions, know-how [14].

In the studies of Hutkevych, S. O. and Androsiuk, L. A. the dependence of the formation of the innovative potential of the enterprise on the innovative features of the personnel accounts for the competencies (the ability of personnel to solve creative problems) and the ability of managers to organize the introduction of innovations at the enterprise [12].

Consideration of the innovative potential of personnel as a component of the overall potential of the enterprise, we have, is quite logical and presents an opportunity to assert the following: despite the fact that the innovative potential of personnel is formed simultaneously with the general, it is this potential that is the decisive internal factor in the formation of the latter, since it contains basic elements (determined by the abilities, opportunities and competencies), is determined by labor and innovative resources, in the presence of which others are rationally used, the needs of consumers are satisfied.

Consequently, the formation of the innovative potential of personnel consists in the development of personnel on the basis of increasing their experience, knowledge, skills, abilities, qualifications – features, which allow the introduction of innovations, as well as the ability of managers to ensure such development and motivate personnel accordingly.

Solving this scientific problem, the starting points for making optimal decisions based on the development of the innovative potential of personnel should recognize the following theoretical provisions: when making optimal decisions, it is necessary to take into account such important features of personnel as qualifications, professional level and level of education, which determine its ability to introduce innovations; when making an assessment, the assessment should establish a relationship between the level of staff motivation to introduce innovations and, accordingly, an increase in innovative activity, with a change in productivity; based on the very definition of the concept of «innovative potential», the assessment should determine the ability of personnel to develop their entrepreneurial abilities and generate knowledge for the commercialization of creative ideas in innovations of their various types and types in order to form the potential of the enterprise and its implementation for development.

8.2 JUSTIFICATION OF THE ALGORITHM FOR MAKING THE OPTIMAL DECISION BASED ON THE INNOVATIVE POTENTIAL OF PERSONNEL

Proceeding from well-grounded theoretical provisions and taking into account the conducted empirical studies on the problems of making optimal decisions, in **Fig. 8.1**, a flowchart for assessing the development of the innovative potential of personnel is proposed. At the same time, the grouping of the subject of assessment according to certain blocks (A, B, C) correlates with certain priority management methods at the enterprise.

According to empirical studies, we have made the distribution of indicators by blocks. The indicators of block A include:

- the average number of personnel;
- the ratio of those taken to quiet, who dropped out;
- demand for workers;
- the number of employees by educational level;
- trained in new professions;
- the number of employees who have improved their qualifications;
- working time fund;
- average monthly salary;
- personnel costs involved in the innovation process;
- the number of personnel involved in the implementation of innovations;
- expenses for training and professional development of personnel.

In block B:

- the number of created innovations;
- the number of innovations offered by the employees of the enterprise;
- capital expenditures for the introduction of innovations;
- the volume of sold innovative products.

Block C:

- net sales proceeds;
- financial results;
- net profit;
- fixed assets;
- long-term financial investments;
- total costs;
- payroll fund;
- the share of the wage fund in total costs;
- cumulative performance.

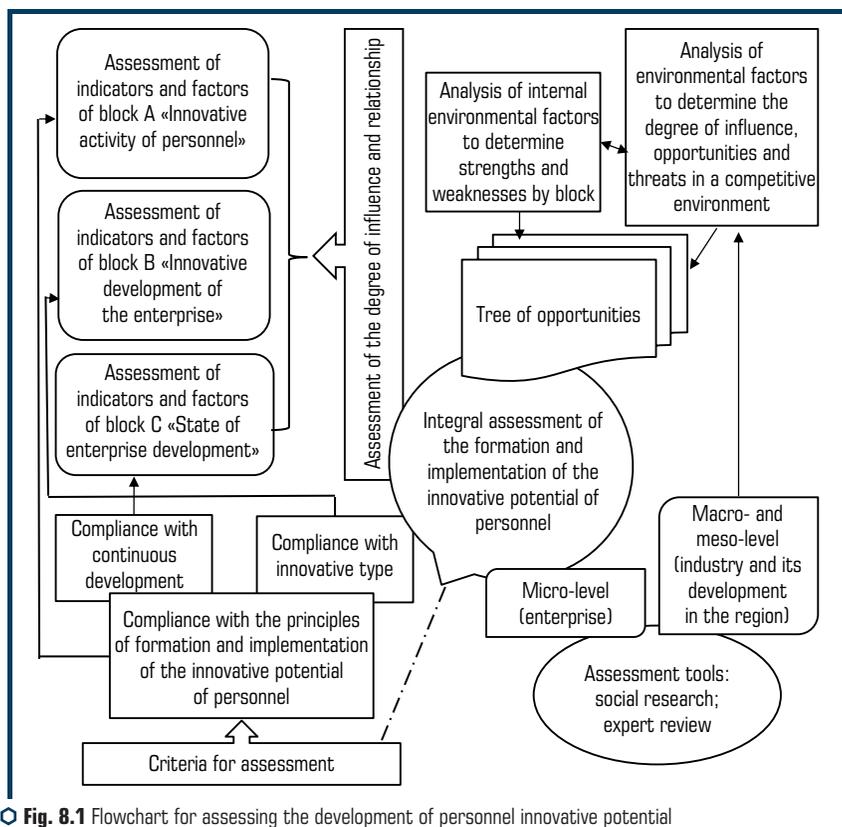
The block diagram developed by us is the basis for making an optimal managerial decision when conducting a comprehensive analysis of the development of an enterprise based on the innovative potential of personnel, where block A is the key communication of the external envi-

ronment with blocks B and C for any enterprise in order to build «Trees of Opportunities» and obtain an integral assessment of the formation and implementation of the innovative potential of personnel at the enterprise.

In order to confirm the practical value of the proposed block diagram (**Fig. 8.1**) and, accordingly, to obtain an integral assessment of the formation and implementation of the innovative potential of personnel, taking into account the levels, tools and criteria, as well as taking into account the need for the degree of influence and relationship between indicators and factors of certain blocks, we consider it expedient to determine the basic methodological approaches using the most effective mathematical apparatus. In this context, the results of scientific research containing scientific approaches to assessing the development of enterprises based on innovation potential are of certain interest [10, 16]. It should be noted that there is no unity among scientists in the classification of approaches to assessing the very potential of an enterprise. So, for example, according to Honcharov, V. M. and Savchenko, M. V. such approaches include factor, criterion, normative, balance, index and cost [10]. In turn, Yaremenko, M. O. measures the potential of enterprises based on such approaches as cost, output and comparative [3]. But, through the use of any of the approaches, its effect is determined by using certain calculation methods and, in particular, a synergistic effect is determined, which reflects several groups of analyzed factors or parameters.

In our case, proceeding from the substantiated starting points for the development of a methodology for assessing the development of the innovative potential of personnel and the developed scheme (**Fig. 8.1**), with the parameters that determine the synergistic effect, include: the obtained assessment of the innovative activity of personnel in block A; an assessment of the innovative development of the enterprise in block B was obtained; an assessment of the overall development of the enterprise in block C was obtained. Taken together, they all make it possible to determine an integral assessment of the formation and implementation of the innovative potential of personnel, and the synergetic effect itself as consisting of two components – a social component (block A) and an economic component (blocks B and C). In turn, the social component contains the effect of the implementation of the labor and innovation potential of the personnel, as well as the tendency to introduce innovations by them, and the economic component – the effect of the implementation of innovations and the result obtained from them, are reflected in the development of the enterprise, the improvement of indicators in blocks B and C.

We believe that such a scientific approach to determining the synergistic effect for making optimal decisions based on the innovative potential of personnel does not contradict the existing scientific approaches contained in the content of works [6, 10, 13, 16, 18], but deepens them taking into account the object of our research. So, in particular, Honcharov, V. M. and Savchenko, M. V., the synergy effect is measured through the real potential of the enterprise, which should be as close as possible to a certain standard ($=1.0$), and consists of three blocks (labor potential, potential of fixed assets and material resources). At the same time, scientists use both calculations of economic indicators and the results of expert assessments of the factors that form the corresponding blocks [10].



The results of research by Akmaiev, A. I., Kliyanenko, B. T., Osyka, O. P., Akhromkin, Ye. M., Fesenko, I. A. in which: firstly, the economic efficiency of innovation is determined by comparing the results with the costs that provided this result (in our case, this approach correlates with the «total productivity» indicator); secondly, in the economic effect in value terms, all types of results and costs due to the introduction of innovations are taken into account (including – in profit, sales volumes, labor productivity); thirdly, the social effect takes into account the social results from the introduction of innovations – an increase in workers' incomes, an increase in the degree of satisfaction of workers' needs, an improvement in the conditions of their work and rest, the quality of life [23], which, in our case, directly indicates the synergy between blocks A and B.

To measure the social effect of the introduction of innovations at the enterprise (the synergy effect in block A), the results of studies by Shcherbak, V. H. are of certain interest [16]. It is

obvious that to determine the social effect from the implementation of the innovative potential of personnel at the enterprise, both the method of calculating the selected indicators contained in the statistical database and the method of sociological research and expert assessment are used to determine the level of motivation of personnel in innovative activities.

The combination of social and economic effects based on the calculation of selected indicators, from our point of view, will reduce to a minimum the inaccuracies of the assessment itself by the key block A when solving the scheme algorithm (Fig. 8.2) and, accordingly, determine the synergistic effect and the integral indicator of the formation and implementation of innovative potential staff.

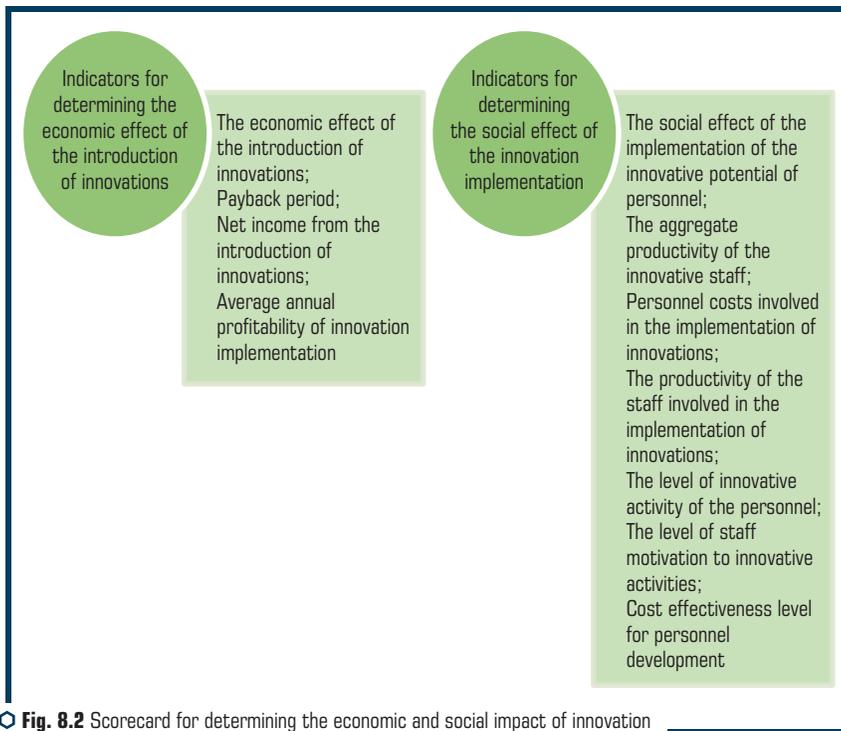


Fig. 8.2 Scorecard for determining the economic and social impact of innovation

Source: improved by the authors

So, based on the generalization of scientific approaches, taking into account the justified starting points for the development of a methodology for assessing the development of the innovative potential of personnel and the developed scheme (Fig. 8.1), we present the following logical and mathematical expression for measuring the synergistic effect (E_s), (8.1):

$$\begin{aligned} \max A &= \sum(A, A_j), \\ \max B &= \sum(B, B_j), \\ \max C &= \sum(C, C_j), \\ E_s &= \sqrt[3]{\max A * \max B * \max C}, \end{aligned} \tag{8.1}$$

where A – total assessment of indicators (i) and factors (j) for block A, which characterizes the innovative activity of personnel, coefficient; In the total assessment of indicators (i) and factors (j) for block B – characterizing the innovative development of the enterprise, coeff.; C – total assessment of indicators (i) and factors (j) for block C, which characterizes the general development of the enterprise, coeff. The optimal (maximum) value for each block is equal to one in accordance with the established standard values for each of the analyzed indicators («and») and factors («j»), calculated on the basis of statistical data («and») and sociological and expert research («j»).

Based on the obtained value « E_s », the degree of development of the innovative potential of personnel is established by restoring the quadrant of dependence between the total estimates for blocks A, B, C using logical and mathematical modeling using the construction of Euler circles [24]. Graphically, the result of the obtained integral assessment of the innovative potential of personnel using this type of modeling is reflected in **Fig. 8.3**.

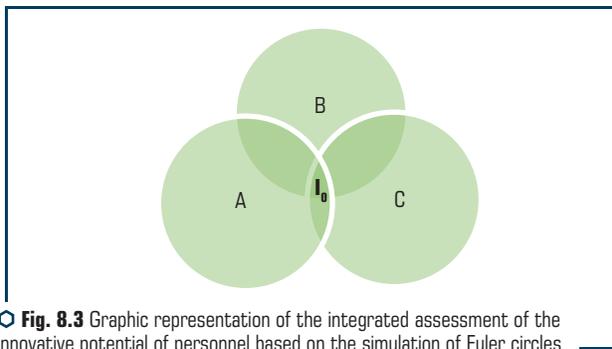


Fig. 8.3 Graphic representation of the integrated assessment of the innovative potential of personnel based on the simulation of Euler circles
 Source: compiled by the authors based on [25, 26]

It should be noted that an integral assessment of the innovative potential of personnel is necessary as a basis for making optimal decisions based on the implementation of the innovative potential of personnel by selecting dominants for each of the selected blocks (**Fig. 8.1**), based on

the real state of development and certain problems. This makes it possible to select the most effective principles and methods of management to overcome existing problems, to determine the appropriate strategic directions for the leaders' actions for the further development of enterprises.

Based on the foregoing, an appropriate algorithm for making an optimal decision is proposed based on the innovative potential of personnel (**Fig. 8.4**), which is implemented and mobilized by managers to solve strategic tasks at each stage of the enterprise life cycle and at each workplace in order to solve the dominant problems of general development, will allow increase overall productivity, improve key performance indicators, ensure the continuous development of the enterprise.

Thus, considering the need to make optimal decisions at any enterprise as a way of further development, this process can be recognized as the main one, because it is of paramount importance in comparison with any others. So, in our case, in order to make an optimal decision, it is necessary to select the dominants of the formation of the innovative potential of personnel, it is a basic condition for developing a management strategy for these enterprises based on the implementation of the innovative potential of personnel. Thus, the strength in the study is the proposed integral assessment of the innovative potential of personnel based on modeling Euler circles, which is the basis for making optimal decisions based on the implementation of the innovative potential of personnel by selecting dominants for each of the selected blocks. The weak side is that the proposed integral assessment of the innovative potential of personnel has no practical approbation. Opportunities for further research are the development of an enterprise development strategy based on the proposed algorithm for making an optimal decision based on the innovative potential of personnel.

There are no threats to the results of the research, because it has been proved by modeling that at each enterprise it is necessary to increase the level of implementation of the formed innovative potential of personnel in order to activate innovative activities and increase the level of innovative development of the enterprise. Summarizing the foregoing, we conclude that in order to achieve the goal of the conducted research, the basic concept is justified, namely: «innovative potential», which is the internal ability of the «enterprise» system to introduce innovations in order to form and realize the potential of the enterprise to ensure intensive development through the generation of knowledge and the commercialization of staff ideas.

Proceeding from well-grounded assumptions, a flowchart has been developed for assessing the development of the innovative potential of personnel, in which the subject of assessment correlates with certain blocks (A, B, C), the use of which will allow for a comprehensive analysis of the development of an enterprise based on innovative potential of personnel, where the key is block A, to establish the factors of influence and interrelation of the external environment with blocks B and C and to carry out an integral assessment of the formation and implementation of the innovative potential of personnel at the enterprise.

Using logical and mathematical modeling using the restoration of Euler circles in the research process, a logical and mathematical expression is presented to measure the synergistic effect by modeling values for blocks and factors affecting their parameters, which will significantly simplify the process of making optimal decisions by the management of the enterprise.

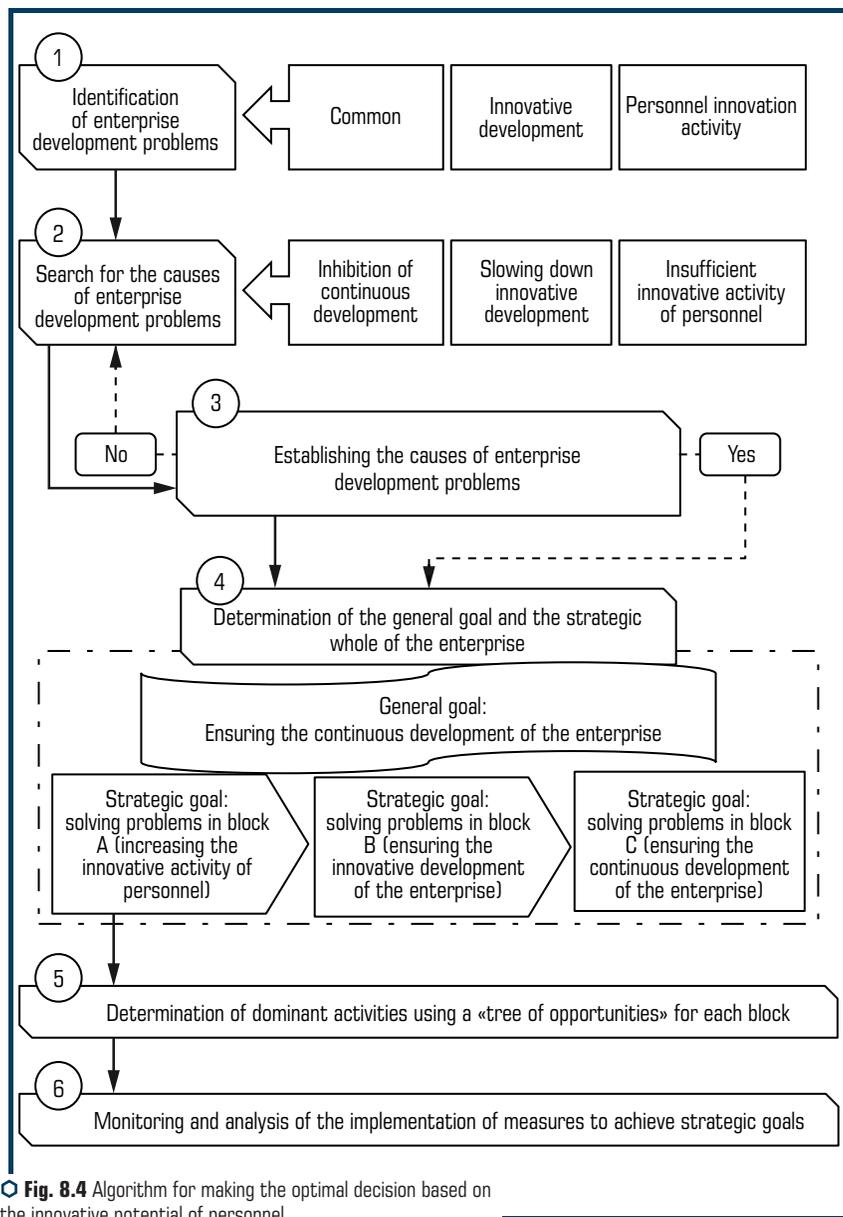


Fig. 8.4 Algorithm for making the optimal decision based on the innovative potential of personnel
 Source: suggested by the authors

To make optimal decisions based on the development of the innovative potential of personnel, an algorithm has been proposed, which consists of 6 stages, starting with identifying the problems of enterprise development and ending with the control and analysis of the implementation of measures and the achievement of strategic goals, and a «tree of opportunities» for determining the dominant measures for the development of the enterprise itself.

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