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SECTION 3. ENTERPRISE ECONOMICS AND PRODUCTION MANAGEMENT

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3.1 Personnel risk management based on the cognitive approach in the context of industry 4.0

Introduction. Risk management is an integral part of the general management of any enterprise that seeks to survive and fulfill its mission. Among the entire set of risks of the company's activity, the dominant risk is the risk of the personnel's activity since labour resources are the primary resources of the company's activity. However, for a long time, this problem was out of the attention of both scientists and practitioners. Thus, in the economic literature, the concepts of "personnel risks", "personnel risks," and "personnel management risks" are still perceived as identical. It is caused mainly by the need for more unified, generally accepted approaches to understanding the essence and classification of personnel risks and behavioural threats.

The problem of personnel risk management also needs to receive proper theoretical study. In many ways, this is caused by the risks associated with human resources that lie in the nature and essence of a person as the most complex object of management, which generates a certain level of informational and behavioural uncertainty and relatively low manageability.

At the same time, the problem of risks arising in the personnel management system reflects the increasing importance of the human factor in organizational development.

Approaches to determining personnel decisions. Personnel management is based on personnel decisions. Personnel decisions are always made in conditions of complete or partial uncertainty. The range of alternatives for solving personnel problems and the possible consequences for each option is directly proportional to the unpredictability of human behaviour. Risk regulation in the personnel management system is necessary for enterprise management, increasing its efficiency and competitiveness.

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Approaches to personnel risk determination are explored in the works of leading scientists (Staeher, 2015; Stone, 2021; Horton, 2016; Becker et al., 2016; Erven, 2019; Huang et al., 2017; Veland et al., 2013).

In the economic literature, personnel risk is characterized by threats from personnel to the enterprise that may lead to danger. The form of their manifestation distinguishes personnel risks into quantitative, qualitative, and risks of personnel disloyalty. At the same time, personnel risks of a quantitative nature appear in the form of threats of financial and market losses due to the lack of necessary employees or their temporary surplus and qualitative risks - due to insufficient qualifications or low responsibility of employees. Risks of disloyalty arise due to abuse of the employer's trust by his disloyal employees (disloyalty in the form of disclosure of information, in the form of corruption or embezzlement, in other formats).

The classification of personnel risks according to the criterion of the causes of their occurrence is based on the grouping according to the level of occurrence of this risk: individual and organizational. The first group consists of biological, social-psychological, spiritual-intellectual and economic categories.

The categories of the second group include risks at the entrance to the organization, during work and at the exit from the organization. They, in turn, consist of different types of risks, in which subtypes of personnel risk can be distinguished in the future.

According to the form of possible loss, personnel risks are universal, as they can potentially cause property and non-property damage to the business entity. At the same time, the second form is more often implemented in enterprises in the sphere of circulation. Usually, it manifests itself in deteriorating their image due to an insufficiently high customer service culture. Property damage is typical for enterprises of all industries. It is realized in a wide variety of forms - from additional costs of the employer, bound by the already concluded tariff agreement with the trade union, to direct losses due to acts of sabotage (Becker et al., 2016; Erven, 2019, Huang et al., 2017; Bucăța, 2022).

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The personnel risk management process generally consists of the following stages:

- identification of risks (identification of potential types of personnel risks occurring in the organization);
- formalization of personnel risks;
- formation of a system of risk management methods (developing specific measures and technologies to minimize personnel risks).

In any method of risk management, it is necessary to identify risks, that is, their components. To identify them, it is essential to understand the risks thoroughly. Risks whose nature is unclear should be avoided. This process involves identifying risks, their sources, subjects and objects. At the same time, detection begins with the most likely and dangerous risks and gradually moves to less potential and costly risks.

The essence of the stage of search and identification of personnel risks is precisely to obtain a clear idea of the current profile of personnel risks for a particular enterprise. Identifying personnel risks is problematic because isolating the actual "personnel risks" is pretty challenging, as they are closely related to other threats. There is a danger of losing the purpose of the personnel risk management system.

Risk factors. The main factors affecting the occurrence of personnel risks, as a rule, include:

1) internal factors that depend on the internal conditions of the enterprise are controlled. That is, they rely on the management of the enterprise and (indirectly) on external factors.

2) external factors that depend on external conditions are not controlled. That is, they do not depend on organizational management but determine the personnel policy of the enterprise.

Accordingly, the causes of personnel risks are also different. Yes, random personnel risks can be caused by the following reasons:

- ✓ lack of awareness of the consequences of one's actions;
- ✓ negligence, inattention, violation, or absence of relevant rules and instructions;

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- ✓ inappropriate intra-corporate training;
- ✓ own vision of the situation (good intentions);
- ✓ gaps between actual and declared organizational values.

Targeted risk behavior is mainly determined by: own vision of the situation (good intentions); personal gain; individual values different from the importance of the organization; low interest in the existence (development) of the organization; intra-corporate political intrigues, intergroup conflicts; disloyalty, demotivation, conflict (sometimes with a specific person).

We suggest that the types of production and economic processes of the enterprise's development be included among the personnel risk factors, including the following: stable functioning; transformational changes; active growth; passive survival. The type of these processes determines changes in the company's work and forms a set of factors that create personnel risks.

The following types of changes should be attributed to the main factors of transformational processes that determine the occurrence of personnel risks at enterprises:

- ✓ workload;
- ✓ types of activities;
- ✓ requirements for the performance of works;
- ✓ working conditions;
- ✓ organizational and management system;
- ✓ approaches to labour evaluation, its results and labor remuneration;
- ✓ social security.

The specified changes lead to changes in the number of personnel, their structure, professional competence, and moral and psychological state. This allows us to conclude that transformational processes cause the emergence of three types of personnel risks, namely:

- 1) the risk of professional competence decrease;
- 2) risks of increasing conflict;
- 3) risk of lack of qualified resources.

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These risks form a risk portfolio, which can be characterized as operational. The significance and duration of operational risks determine the emergence of strategic risks - risks of resource shortages, loss of the company's human capital, and the deterioration of the quality of working life.

In our opinion, the prerequisite for using the term "personnel risk portfolio" is that the set of personnel risks gives a specific synergetic effect manifested by increasing and reducing threats.

The formalization of personnel risks is related to their assessment. Difficulties determining the quantitative parameters of personnel risks are connected, first of all, with the impossibility of an objective quantitative assessment of people's behaviour. However, in the theory of risk management and other studies on risk problems, there are specific approaches to determining the criteria for quantitative assessment of risks, which can also be used to assess personnel risks.

At the stage of quantitative risk analysis, the numerical values of individual risks and the risk of the portfolio as a whole are calculated. A possible loss is also revealed, and a cost estimate is given from the manifestation of the risk. Finally, the final stage of the quantitative assessment is developing a system of anti-risk measures and calculating their cost equivalent.

Quantitative analysis can be formalized using probability theory, mathematical statistics, and operations research theory tools. The most common methods of quantitative risk analysis are statistical, analytical, the process of expert assessments, and analogue method.

Risk management requires the application of measures to eliminate them. There are no clear, well-developed recommendations for reducing and preventing personnel risk.

Risk transfer methods are used in personnel work throughout staffing, outsourcing, or leasing of personnel; insurance (in terms of personnel insurance and employer's liability insurance); warnings (documentary and administrative ways, restriction of access to information, resources, business intelligence, etc.); forecasting and planning of human resources of the organization.

Risk determination methods. Ensuring the effectiveness of measures to eliminate risks and threats requires using modeling mechanisms, among which in the context of uncertainty in the study (Harris et al., 2002; Strube, 2001; Sperry et al., 2019; Wang Xin et al., 2020).

For this purpose, an expert-cognitive method of managing the personnel risks of enterprises, based on the application of iteration procedure of expert evaluation of the main factors of the external and internal environment, which influence the emergence of risky situations, with the purpose of discrete adaptation of the risk management mechanism used in the enterprise to minimize the enterprise for minimization is developed on this purpose. Possible deviations of controlled indicators of risky situations.

The specified iteration procedure consists of two main stages:

1. Identifying the most significant risk-external and internal risk facilities and determining the initial set of practical measures to reduce the possibility of risky situations or minimize their consequences.

2. Choosing based on the information obtained effectively by the criterion of the management decision.

It is proposed to build a fuzzy cognitive model to evaluate the relationship of these factors (causes, indicators, portfolio of risks, and measures to eliminate them). Consider the main stages of its construction.

The first stage is to substantiate the composition of a fuzzy cognitive model's structure (set of concepts) and evaluate systemic factors' relationships.

The second stage is the setting of many concepts that characterize identified sources (hazards) of personnel risks:

The fuzzy and logical procedure for selecting personnel management decisions at enterprises should take into account four main groups of elements and parameters: directly the type of personnel risks; environmental factors that affect the occurrence and level of various risks; indicators (indicators) of risky situations; list of measures to prevent or reduce the level of different types of hazards. The relationships between

these elements that characterize their mutual influence on each other should also be determined.

When developing this procedure, it is necessary to formalize the direction and force of these relationships in the presence of qualitative expert information.

Figure 1 presents the block diagram of the essential elements and parameters, which should be considered in the fuzzy and logical procedure of selecting decision-making decisions.

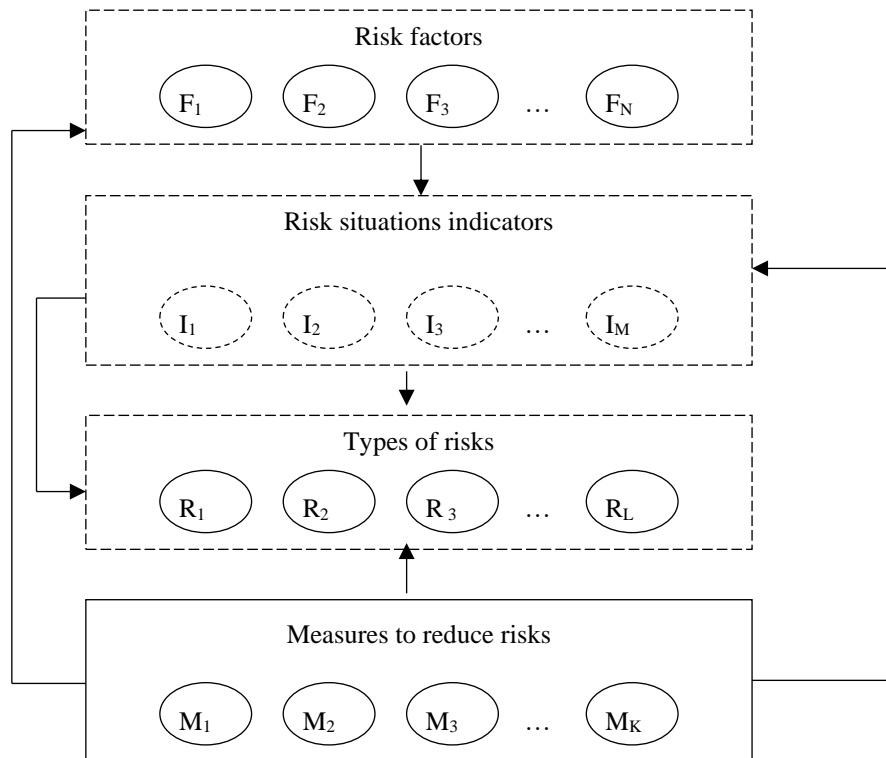


Fig. 1. Block diagram of the elements and parameters of the personnel risk management procedure of enterprises

When developing the procedure for the occurrence of risk situations, the following factors are considered: change in workload (F_1); change of activities (F_2); change of requirements for the performance of works (F_3); modification of working conditions (F_4); evolution of the organizational and management system (F_5); change in approaches to labour evaluation, its results and labour remuneration (F_6); changes in social security (F_7).

Indicators of risk situations include staff turnover due to dismissal (I_1), level of professional competence (I_2), and status of psychological comfort (I_3).

Types of risks: the risk of reducing professional competence (R_1); risks of increasing conflict (R_2); risk of shortage of resources (R_3).

The main sets of measures for the prevention and minimization of personnel risks include optimization of the number of people (M_1), improvement of competence (M_2), strengthening of motivation (M_3), and reduction of resistance to changes (M_4).

Based on the proposed elements, a fuzzy-cognitive map was built, characterized by concept nodes reflecting the sources of risk situations in the enterprise environment and nodes reflecting risk management measures (Fig. 2).

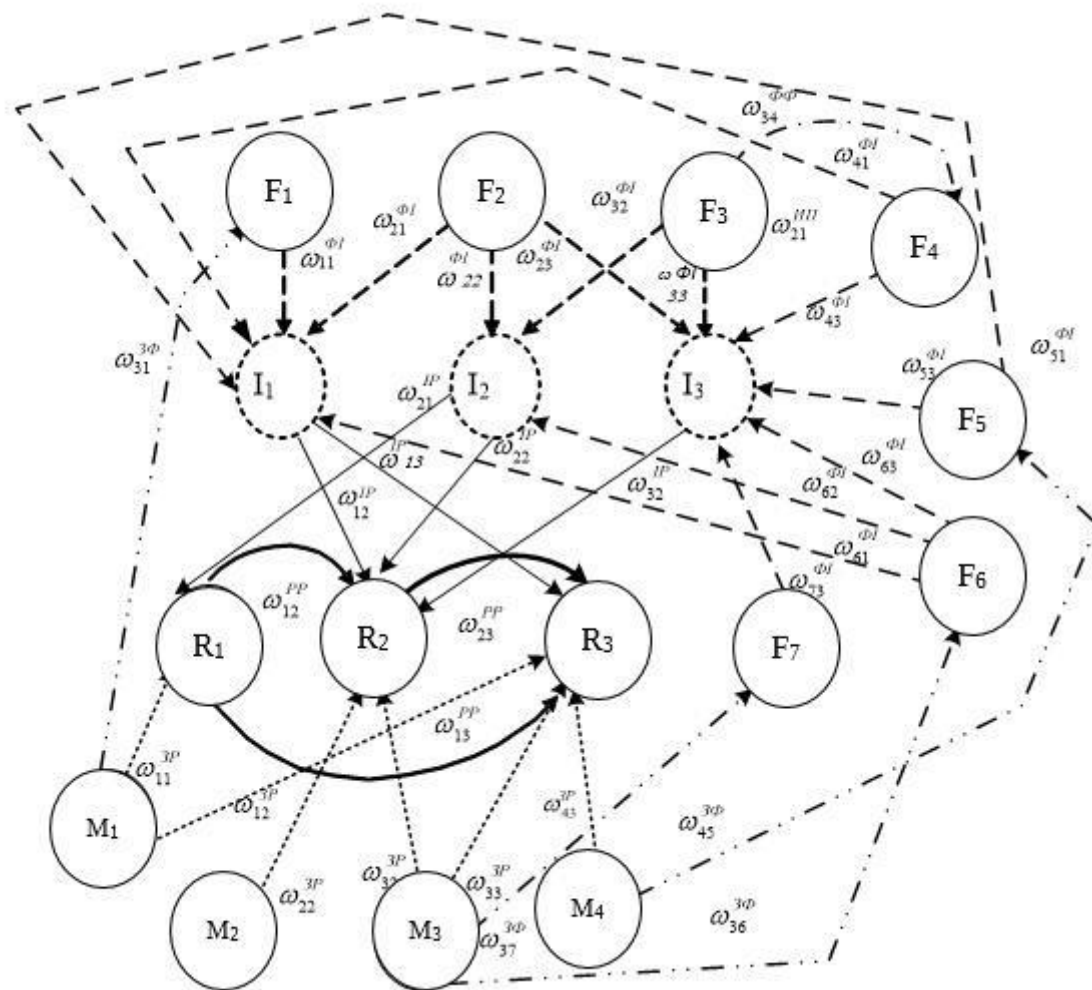


Fig. 2. Cognitive map for personnel risk management of enterprises

Influence relationships between concept nodes, that is, the weight of graph arcs of the cognitive map, are presented in the form of scales, which are elements of a vague adjacency matrix formed based on expert information analysis.

Thus, the proposed model for assessing the interrelationship of the factors of the external and internal environment of the enterprise, based on the construction of fuzzy

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cognitive maps, will allow assessing of the degree of influence of the selected factors on the main sources of risks and, based on the obtained assessment, to more effectively carry out the selection of measures aimed at evading the enterprise from personnel risks.

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