Alexseev Viktor

PhD of Technical Sciences, Associate Professor,

Associate Professor of the Department of Information and Computer Systems Design

Educational Institution «Belarusian State University of Informatics and Radioelectronics»,

Republic of Belarus

Matyushkov Vladimir

DSc of technical sciences, professor, head

center of scientific and technical programs and scientific work

Open Joint Stock Company «Planar», Republic of Belarus

Pisarchik Andrey

Assistant of the Department of Information and Computer Systems Design

Educational Institution «Belarusian State University of Informatics and Radioelectronics»,

Republic of Belarus

MODELING A TWO-LEVEL RISK REDUCTION OF AN ENTERPRISE IN THE FORMATION OF STAFF COMPETENCE

Abstract. *An analysis of the possibility of modeling the risk reduction of an enterprise in the formation of the competence of management personnel, based on fundamental research by leading scientists, was carried out. It is shown that at the enterprise it is possible to distinguish different levels of activity associated with risks in the formation of personnel competencies (current management activities and training of specialists). It is concluded that the modeling of two-level risk reduction can be classified as a non-linear stochastic programming problem due to the clearly non-linear relationships between the model variables and the probabilistic optimality criterion.*

Keywords: *innovations in personnel, personnel risks, modeling of enterprise risk reduction, management activities.*

When introducing innovations in personnel, enterprises have certain financial risks. These risks can lead to certain losses. To prevent or reduce them, certain costs are required for the analysis of the level of risks and their reduction. These costs must be minimized taking into account possible losses, in other words, optimized. To assess the risk, you can use, for example, the ISO 31000 standard, as well as

various methods and approaches, including mathematical ones, but the risks associated with personnel are specific and therefore mathematical methods for their assessment require refinement and development. Therefore, the issues of developing mathematical models and methods for assessing risks to form the necessary competencies of personnel at enterprises in the real sector of the economy, to find ways to reduce risks are relevant and important for theory and practice.

The authors analyzed the possibility of modeling the risk reduction of an enterprise in the formation of the competence of management personnel, built on fundamental research by leading scientists:

– general approaches to mathematical modeling of socio-economic systems, their stability and management, developed in the works of K.A. Bagrinovsky [1–3], A.N. Ilchenko [4], M. Intriligator [5], L.V. Kantorovich [6], V.A. Kardash [7], A.I. Orlov [8, 9], P.S. Barkalov [10] and others;

– significant works on statistical modeling and forecasting of economic processes are the works of S.A. Ayvazyan [11], K.Dougherty [12], M.P. Vlasov [13] and others.

At the enterprise, it is possible to distinguish different levels of activity associated with risks in the formation of personnel competencies: current management activities and training of specialists.

Let us consider in more detail the features of each direction from the position of risks.

Current management activities should provide low risks of making strategic and tactical management decisions. This implies that orders (decisions) should be low risk. There are many of these decisions, they can always arise, at arbitrary moments in time, and you cannot determine them in advance, you cannot prepare a "recipe" for the behavior of the person making the decision. Therefore, these risks need to be reduced.

When sending his staff for training to solve the problems of enterprise development, the manager determines the direction of training, specific tasks (planned learning outcomes), selects the staff sent for training, coordinates the program and other requirements for the training process. The foregoing allows you

to create conditions that can significantly reduce the likelihood of a danger associated with training. The correctness of these decisions is determined by the level of competence of management personnel.

One of the main ways to reduce such risks, taking into account their special features, is the training of management personnel at different levels (high and medium) in terms of management (management). Tool The higher the level of managerial training, the less wrong decisions, the less risks. Although it is very difficult to formally express the relationship between the level of training (or total costs, taking into account previous training) and the level of risks of decisions being made.

It is necessary to take into account the specifics of the training of senior staff: individuality, informality of training, constancy (high frequency of training with a short duration at a time), a small number of managers, and relatively low training costs. All this leads to the fact that we can assume that decisions are made mainly at a certain conditionally constant level of competence of top personnel in a certain period of time (for example, during the year). Therefore, the main task is to minimize the risks from making managerial decisions.

In this case, the total risk of control decisions should be chosen as the optimality criterion.

It should be taken into account that the risk is of a random nature, therefore, in this case, with a set of managerial decisions made, one should talk about the mathematical expectation of risk on the totality of all managerial decisions of the enterprise, and not about its specific value.

In this direction of developing a complete model, it is necessary to solve the problem of formalizing the relationship between the total costs of training senior personnel and the generalized (averaged) risks of decisions made.

Training of specialists. When training specialists, there are dangers and risks of training. This is already a different level of risks for the enterprise, it is determined mainly by the educational institution. These risks must be guaranteed to be within the acceptable range, there is no need to minimize them, since reducing risks below the acceptable level will require large, and unjustified costs. But it is necessary to

reduce the costs to achieve this acceptable (tolerable) level of risk. In this case, there are relatively large costs (due to a large number of trainees, a longer duration of training, separation from production, etc.). This implies the need to reduce (minimize) the total costs of providing a given level of risks (learning risks) in all projects for a given period of time.

The most effective way to reduce the total cost of personnel training is the competent formation of the goals and objectives of training, training programs, places of training (selection of educational institutions), selection of personnel for training.

When conducting training in order to form the competencies of specialists, one should take into account the main limitation on the risks of training.

The risk absorption rule (option 1) assumes that when drawing up a personnel training program for a year, it leads to the fact that the maximum risk of projects can be taken as the training risk. In this case, all other projects will obviously give less risk.

When implementing work on each individual personnel training project (option 2), it is necessary to limit the risk at its acceptable level in each specific case.

When choosing a learning risk, various options can be taken into account. Such a formulation can be applicable to any implementation of a training project, but the given level of acceptable risk can be different in each project, determined by economic feasibility and expediency for the enterprise.

Formalization of the problem statement for modeling a two-level enterprise risk reduction. The probability of risk in the formation of personnel competence is determined mainly by the educational institution, since its activities may not meet the requirements formulated by the enterprise before sending personnel for training.

Setting the task for training, selected from the set - the number of people sent for training. Not only the direct costs of training depend on this amount, but also the losses that the enterprise will have if several specialists do not master the training program or transfer them to another job after training both within the enterprise and to another after training. In this case, there will be a failure to achieve the goal of the planned modernization of the enterprise's activities (the introduction of new

equipment, technology, changes in the organizational structure, the introduction of new systems, and so on) due to the reduction of trained specialists on whom the enterprise was counting. An increase in the number of trained specialists against the minimum required (training with a "reserve" in quantitative terms) can drastically reduce the severity of the consequences even with additional costs for training the "insurance task of trained personnel".

The severity of the consequences mainly depends on the enterprise, on the level of preparedness and management personnel.

The severity of the consequences for each risk depends on the setting of the learning objective and on the use of learning outcomes, and this in turn is determined by the level of training of managers and those who set the learning task.

In addition, the cost of training must be included in the severity of the consequences.

It is also necessary to include in the severity of the consequences for the enterprise the consequence of failure to achieve the development goals of the enterprise as a result of training, associated with the "loss" of part of the trained personnel (in this case, failure to achieve the goal should be expressed in monetary units, like other costs). These losses, of course, will depend on the number of trained employees whose new intellectual potential was not used by the enterprise (for this amount, additional training of new employees will have to be carried out).

Minimization of the criterion of optimality of the task of the upper level can be carried out by allocating funds for managerial training of the organization's management, the formation of a training program, methods of conducting training.

In the general case, this model belongs to the problems of nonlinear stochastic programming due to the clearly nonlinear relationships between the variables of the model and the probabilistic optimality criterion. Therefore, its solution in general is extremely difficult.

References:

1. Bagrinovsky, K.A. Mechanisms of technological development of the Russian economy / K.A. Bagrinovsky, M.A. Bendikov, E.Yu. Khrustalev – M.: Nauka, Series: Economic science of modern Russia, 2003. – 376 p.

2. Bagrinovsky, K.A. Modern methods of managing technological development / K.A. Bagrinovsky, M.A. Bendikov, E.Yu. Khrustalev – M.: Russian Political Encyclopedia, 2001. – 272 p.

3. Bagrinovsky, K.A. Economic-mathematical methods and models. Microeconomics / K.A. Bagrinovsky, V.M. Matyushok – M.: Publishing house of the Russian University of Peoples' Friendship, 2006. – 224 p.

4. Ilchenko, A.N. Economic and mathematical methods / A.N. Ilchenko // Proc. allowance. – M.: Finance and statistics, 2006. – 288 p.

5. Intriligator, M. Mathematical methods of optimization and economic theory / M. Intriligator – M.: Iris-Press, 2002. – 576 p.

6. Kantorovich, L.V. Functional analysis / L.V. Kantorovich, G.P. Akilov - BHV-Petersburg, Nevsky Dialect, 2004. – 816 p.

7. Kardash, V.A. Conflicts and compromises in the market economy / V.A. Kardash – M.: Nauka, Series: Economic science of modern Russia, 2006. – 248 p.

8. Orlov, A.I. Management. Textbook / A.I. Orlov – M .: Publishing house "Izumrud", 2003. – 298 p.

9. Orlov, A.I. Non-numerical statistics / A.I. Orlov – M.: MZ-Press, 2004. – 513 p.

10. Barkalov, S.A. Mathematical foundations of project management / S.A. Barkalov [and others], ed. V. Burkova – M .: Publishing House: Higher School, 2005. – 424 p.

11. Ayvazyan, S.A. Applied statistics. Fundamentals of econometrics. Textbook for universities / S.A. Ayvazyan – In 2 vols. Vol. 2, 2nd ed., Rev. – M.: UNITI-DANA, 2001. – 432 p.

12. Dougherty, K. Introduction to econometrics: Textbook. 3rd ed. / Per. from English. / K. Dougherty – M: Infra-M, 2009. – XIV, 465 p.

13. Vlasov, M.P. Modeling of economic processes / M.P. Vlasov, P.D. Shimko. - Rostov n / D: Phoenix, 2005. – 409 p.