

Modelling techniques for rational management decisions considering innovative risk

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Abstract. The article is devoted to the problems of development of theoretical and practical recommendations for the improvement of rational decision modeling process considering innovation risks. Based on the review of domestic and foreign techniques to management decision based on consideration of the risk factor, the basic theoretical flaws and practical difficulties faced by Ukrainian enterprises were systematized. In the article the methodical approach was accepted to making rational management decisions based on consideration of options - the current assessment of innovative risk, its future level and managers' propensity for risk.

Key words: innovative risk, rational decision-making.

INTRODUCTION

It is well known that economic growth of Ukraine to the level of developed European countries is possible on condition of activation of innovation such as the development of knowledge-based and competitive innovation and active implementation in practical economic activity. However, this process is accompanied by a number of risks both those common to all entities and the specific ones, that arise during the implementation of innovations. These risks are not only hinder the progress of the innovation in the real economy, but are defining reasons for making management decisions in terms of innovation. Note that the successful functioning of any organization is also determined by the quality and timeliness of rational decision-making that is especially actual for enterprises innovators. Ensuring a stable and effective innovation in economic activity should, primarily, be based on reliable estimation of innovative risk and, on this basis, the taking of rational management decisions.

In the modern changing environment, the current evaluation of innovative risk and predicting its level does not provide reasonable grounds for a successful reaction to it. Accordingly, there is a need to review and improve approaches to evaluating and predicting innovation risk, taking into account the multidimensional nature of the

phenomenon and its dynamic changes. Predictions, which objectively evaluate innovation risk and forecast scenarios of its development, provide reliable information for making rational decisions.

Today, the decision-making manager is facing a number of obstacles, namely uncertainty of the environment, rapid changes in business principles, existence of significant influences such as macro risks and unpredictable internal risks, the complexity of predicting the future picture of reality, taking into account the interests of stakeholders, information insufficiency and impropriety, limited technical and technological support for analyzing the situation. That is why, during making decisions, the manager must take into account the large number of conditions such as the situation of the enterprise as a whole and the state of innovation as well as the risks that accompany it. Under such circumstances, the manager is facing an extremely difficult task. On one hand - the development of alternative solutions that meet all of the possible scenarios of risk and take into account the possibility of the company, and on the other - reasoning and choosing the most rational management decisions. The situation is complicated by the fact that even in challenging situations the manager must ensure the efficient and uninterrupted operation of the enterprise and minimize the impact of his own subjectivity.

Under these conditions, there is an objective need for the development and substantiation of the method of election of rational management decisions with multiple alternatives, which will be based on the simultaneous consideration of all the options such as innovation risk, and features such as activities or subjective characteristics of the manager, and optimize management decisions from the point of view of effectiveness and usefulness. Thus, the purpose of the article is improving methodical approach to modeling rational management decisions considering innovative risk.

LITERATURE REVIEW

Current state of management science in Ukraine and in the world is characterized by seating for new approaches to modeling rational decision-making process. That is why, this research author is primarily drawn to fundamental results, namely based on the theoretical, methodological and practical results related to management decisions, innovation management, risk management, received by both domestic and foreign scientists. V. Abchuk, M. Bakanov, I. Balabanov, V. Vasiliev, O. Kuzmin, A. Sheremet [2,8,15] focused attention on the fact that under modern conditions the basic requirement to management decisions is its focus on the profitability and efficiency of the whole enterprise contributed to the development of management science. However, scientific researches do not give appropriate attention to solving the problem of selection of rational management decisions of multiple alternatives considering risk factors and propensity of managers to take risky decisions. Not enough attention is paid to formalizing and structuring the process itself and the grounds of rational decision-making.

Significant contribution to the research of problems of existence of innovation risk and risk management company, made the following domestic and foreign scientists as A. Alhin, J. Balabanov, I. Blank, A. Vasyurenko, V. Vitlinskyy, D. Voronkova, M. Vnukova, P. Grabovoy, V. Granaturov, L. Gohberg, S. Illyashenko, T. Klebanov, G. Kleiner, O. Kuzmin, M. Lapusta, A. Morgenstern, F. Knight, J. Neumann, C. Redhem, B. Raysberh, L. Tepman, E. Utkin, R. Fathutdynov, J Schumpeter [1-16] and others. These and other researchers in his works investigated the nature of the category of "risk" classified innovative risks, developed methods for evaluating and predicting levels of risk, model risk management decision-making and so on. However, under conditions of dynamic phenomena and processes accompanying activities of companies limited time factor, a significant effect of subjective human factor, there is a need to provide a comprehensive assessment of the risks of innovation, forming optimal set of response measures based on the selection scenario risk events and making rational management decisions aimed at proper response to identified risks.

Analyzing the work of the above-described scientists it may be summarized that:

- insufficient attention is paid to the generalization and systematization of risk factors with substantiated separation of the defining reason;
- methods of quantitative evaluation of innovative risk and planning response measures to them are insufficiently substantiated. In particular, there is a need for developing a method of risk assessment which, unlike the existing ones, would be based on consideration of multilateral parameters of the phenomenon to which most of the conditions of development of innovation by Ukrainian enterprises are tied;

- to evaluate decision alternatives, usually classic criteria are used: Wald, Bayes, Laplace, Savage, Hurwitz, Hodges-Lehmann focused on the minimum, maximum or average value of performance evaluation and criteria. Hurwitz and Hodges-Lehmann required that subjects objectively assessed the probability of occurrence of certain risks that are not always objective. Therefore further study is required on the possibility of using complex mathematical models which should adequately reflect the multidimensional nature of innovation risk and multipurpose nature of rational management decisions;
- there is need for further research and improvement of the theoretical and methodological tools to account for the propensity to take risky decisions;
- foreign methods and practical methodologies developed as separate entities and public institutions are highly specialized, often relating to a particular point and type of operation and certain types of risk;
- foreign scientists have formulated a set of classical, modern approaches for assessing behavioral dispositions to risk and decision making under uncertainty. However, the domestic industrial sector is characterized by specific original features that prevent the use of foreign instruments. That is why, there is need for tools developed to evaluate propensity of managers to take risky decisions, which would take into account both personal and professional features.
- There is need for further research on the grounds for making rational management decisions under the influence of innovation risk.

These and other drawbacks in the national and international scientific opinion form the need for scientific research towards improving the modeling of rational management decisions based on innovative risk.

METODOLOGY OF MODELING TECHNIQUES FOR RATIONAL MANAGEMENT DECISION CONSIDERING INNOVATIVE RISK

The existence of a substantial list of risks which are typical innovation is one of the major factors hindering the progress of the entities and forces managers to give up the introduction of the various innovations. At the same time, business conditions make it impossible to perform rational decision-making based on information about the current condition of the company, the state of innovation, information about the possible loss or rely on experience and intuition of the manager.

In such difficult conditions, which exacerbated the influence of a number of risks there are difficulties and conflicts between developed theoretically grounded approaches and practical implementation. The theoretical foundation of rational management decisions in innovative risk means that you must take into account all factors that affect the development and innovation, specific risk factors, other characteristics of the individual decision-making. In practice, usually it is either impossible to

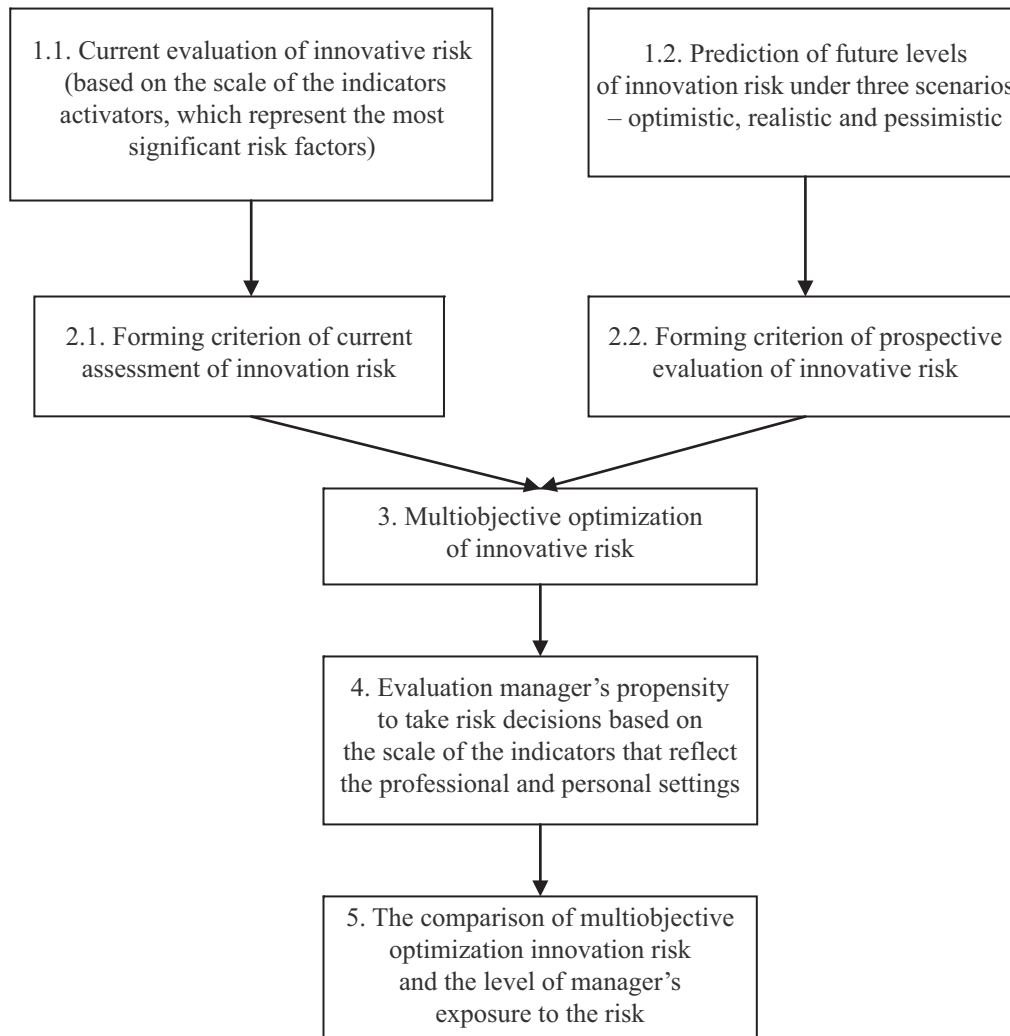


Fig. 1. The sequence of process modelling rational management decision

implement or results in significant loss of funds and time. So research on the effect of the proposed approach will try to formalize all the necessary parameters for making rational decisions to ensure practical feasibility of the results.

The question of rational decisions should be solved in the context of maintaining the completeness of information regarding the impact of the set of risk factors and the use of scientifically mathematical models.

Considering the above-mentioned facts, the need is for updated modelling acceptance of rational management decisions aimed at the adequate response to innovative risk. To ensure rational decision-making requires a clear outline of the reasons for election of such decisions with multiple alternatives. Rationale and development of these bases underlie improvement of the modelling of rational management decisions based on innovative risk (Figure 1).

Proposed authored provisions to improvement of decision-making based on innovative risk are:

- 1) objective evaluation of the level of innovative risk:
 - ongoing evaluation of innovative risk based on the scale of the key indicators-activators;

- prediction of risk events based on defining performance-activators and, taking into account the possible scenarios of risk events (pessimistic, realistic and optimistic scenarios);
- 2) propensity evaluation of manager to take risky decisions:
 - evaluation of professional parameters manager;
 - evaluation of personal characteristics;
- 3) comparison of the level of innovation risks (the current and projected approach) and the level of propensity risk manager to take decisions.

These points are the criteria of optimality of rational management decisions and serve the formalization and modeling.

CONCLUSIONS

Thus, the advantages of the proposed approach to modeling rational management decisions based on innovative risk are:

- 1) rationality of decisions based on complete and objective information on specific features of innovation risks:

- complexity of the elaboration innovations - the current criteria for evaluating the risk level is functionally dependent on the parameters of elaboration innovations, the parameters of the entire enterprise and reflect the defining characteristics of the most significant risk factors and at the same time take into account the strength of the impact of these parameters for each of the analyzed period;
- considering the dynamic nature of risk events - prospective evaluation criteria are made based on future values of innovation risk levels;
- alternative options for the development of innovative risk - formalization of risk events based on performance-activators, which fully represent the most significant risk factors in three possible scenarios - pessimistic, rational and optimistic;
- preservation of the entire information set the object of research and consideration of the variability and uniqueness of each individual case, which is provided by the use of multi-criteria optimization;
- 2) leveling influence of the subjective factor of the manager - analysis of personality characteristics, based on the research of his temperament, speed of information processing, reaction rate in critical conditions, etc.;
- ensuring optimality management decisions based on consideration of any number of combinations “risk level - the level of manager propensity to the risk”;
- take into account dynamic character, objective-subjective nature of innovation risk and justification of the existence of a causal relationship “risk - the tendency of managers to take risks - the rational management decisions” create conditions for not only additional analytical information to improve innovation but there is standardized pattern that can be applied to any other type of risk and crisis of the whole enterprise.

To summarize should be noted that the results of the proposed methodological approach can be represented in two ways:

- in the narrow aspect research results contribute to the solution of management problems, namely based on the vision of the state of innovation of the whole enterprise formalization manager characteristics that indicate a tendency to take risks and, combining the most important objectives of the enterprise, choose the rational management decisions under the influence of risks;
- in the broadest sense - the findings will contribute to the solution of philosophical problems, specifically ideological and cognitive problems in terms of appropriateness and reasonableness as well as the formalization of all processes and elements of the enterprise, in particular, the behavior of people who make management decisions.

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