

ARTICLE IMPROVING THE SUSTAINABILITY OF THE REGIONAL ECONOMIC SYSTEM THROUGH THE OPTIMIZATION OF MODELS OF MANAGEMENT OF SMALL INNOVATIVE ENTERPRISES

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ABSTRACT

The activity of innovation relations in the economic system depends on external and internal factors inherent in different phases of the economic cycle. The most important factor is the parameters of demand for innovative objects of different nature. It is these parameters that determine the strategy of a small innovative enterprise (MIP) during periods of recession, depression, and economic activity in the country. So, for example, let us ask ourselves what strategy MIP should use during the recession, what products of its activity should it bring to the market? The most common answer to this question is that it is necessary to bring to the market innovations of only incremental nature at extremely low prices. This is explained by a decrease in the level of income of the population due to rising unemployment, bankruptcy of enterprises and other reasons. At the same time, this approach does not take into account the most important factor - the stratification of the population by income level. Having estimated the degree of this stratification, MIP can significantly change its strategy. For such an assessment, you can use the well-known Ginny coefficient. The Ginny coefficient (income concentration index) characterizes the degree of deviation of the actual distribution of monetary incomes of the population from the line of their uniform distribution. The value of the coefficient can vary from 0 to 1, at the same time, the higher the value of the indicator, the more unevenly distributed income in the society. During the recession, the degree of population is stratification in the Russian Federation has grown. Thus, according to the data of the State Statistics Committee of the Russian Federation in 2018, the Ginny coefficient indicates an increase in the degree of population stratification by income level, and therefore, in terms of demand parameters for objects of innovation of a different nature.

INTRODUCTION

KEY WORDS

Economics, econometrics, economic and mathematical modeling, economic theory, regional economy, innovation management.

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*Corresponding Author Email: i.beilin@rambler.ru Tel.: +7 927 410 44 91 The share of the population with a relatively higher average monthly income (from 15,000 to more than 25,000) for the period 2007–2018 increased from 26, 9% to 35.1%. It follows that this stratum of the population will continue to place demands on innovations of an improved and breakthrough nature. Here, however, it should be noted that the cited official statistics significantly underestimate the real level of income, which is partially obtained by the so-called "gray" schemes [1-4]. Even such a superficial analysis allows us to conclude that when developing a MIP strategy in the recession phase, one should focus on the stratified demand shown by economic agents for innovative objects.

Similarly, the demand for innovation should also be raised in the phase of economic growth, when there is an excessive demand for products in general and for innovations in particular. The unwinding of the "positive spiral" may in the end lead to the collapse of the economy. One of the reasons for this condition is the elimination of the "financial bubble", which arises, including under the influence of the rush demand for innovative objects of an improved and breakthrough nature. To prevent such a state, the MIP strategy during this period should be sufficiently flexible, providing for a combination of the launch of various innovative objects in the market. Secondly, this strategy should take into account the tax and investment policies of the federal and regional authorities that are changing during the boom period [5-9]. Thirdly, the MIP strategy should provide for the restructuring of the innovation cycle, strengthening the fundamental and applied areas of research, creating scientific groundwork for the development of preferred R & D, the relevance of which should be predicted for the subsequent phases of the business cycle.

Innovative activity is most susceptible to the influence of medium-term and long-wave oscillations, the basis of which is the transition to new technological structures. An analysis of the state of the economy during the recession and recovery suggests that new scientific ideas may not be in demand, since the public and private investment strategy during the recession was aimed primarily at "saving" financial markets, and not at developing R & D. The level of science in the manufacturing sector of Russia, calculated as a share of R & D expenditures in GDP, in 2007 was 1.17% of GDP, while in the USA it was 2.7%, and the average for EU countries was close to 1, 9%. In contrast to developed countries, the corporate science sector in Russia is not yet sufficiently developed and does not play such a significant role as in the West, since the process of forming large high-tech companies and holding companies is not yet completed [10-16]. According to some estimates, in Russia today, the largest corporations spend about \$ 50-100 thousand annually on R & D annually, seriously lagging behind Western corporations on the scale of in-house research and development. For comparison: each of the 25 transnational corporations based in Europe spends on research and development more than 1 billion euros annually. The total costs of these high-tech multinational companies for research and development are 62 billion euros.



MATERIALS AND METHODS

The ability of an enterprise to adapt to changes in the external environment is influenced by the way the enterprise is organized, how the management structure is built.

The organizational structure of an enterprise is a set of links (structural units) and links between them. The choice of organizational structure depends on factors such as:

The legal form of the enterprise; Field of activity (type of products, its range and range); The scale of the enterprise (production volume, number of personnel); Markets, which the company goes in the process of economic activity; Used technologies; Information flows inside and outside the company; Degree of relative endowment with resources,

Considering the organizational structure of enterprise management, they also take into account the levels of interaction: organizations with the external environment; organizational units; organizations with people [17-23]. An important role here is played by the structure of the organization, through which and through which this interaction takes place. The structure of the company is the composition and ratio of its internal units and departments.

Different organizations have different types of governance structures. However, there are usually several universal types of organizational management structures, such as linear structure, line-heading, functional, linear-functional, matrix. Sometimes inside a single company (as a rule, it is a big business) separate divisions are separated. It should be remembered that the choice of management structure depends on the strategic plans of the organization [24-27]. The organizational structure governs: separation of tasks by departments and divisions; their competence in solving certain problems; general interaction of these elements. Thus, the company is created as a hierarchical structure.

RESULTS AND DISCUSSION

The basic laws of rational organization: rationalization of tasks in accordance with the most important points of the process; bringing management tasks into line with the principles of competence and responsibility, coordinating the "solution field" and available information, the ability of competent functional units to accept new tasks for solving); Mandatory distribution of responsibility (not for the sphere, but for the "process"); short control paths; balance of stability and flexibility; ability to self-organization and activity; the desirability of stability cyclically repetitive actions [Fig. 1].



Fig. 1: Rationalization of tasks in accordance with the most important points of the process.

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The innovation policy pursued by the state in the Russian Federation has led to a significant lag in the scientific and technical sphere of Russia from the developed countries of Europe, America, and Asia.



Depending on the scale and level of impact on the economy, strategies of small innovative enterprises (SIE) are divided into three main types: macro-innovative and micro-innovative. Their differences lie in the degree of dependence on the methods of state administration of innovations, the territorial location of the IIP, and their overall goals of economic development [28-30]. The SIE strategy in a cyclical economy assumes the orientation of the activities of these enterprises to depending on the degree of income stratification of the population, the demand placed on innovative objects of different nature.

Being a part of the general strategy of economic development of an enterprise, the investment strategy is subordinate to it and must be consistent with its goals and directions. However, the investment strategy itself has a significant impact on the formation of a general strategy for the economic development of an enterprise.

During the period of transition of the economy from one phase of the economic cycle to another, when uncertainty increases significantly, the investment activity of an enterprise often comes down solely to meeting its current investment needs, determined by the need to replace the retiring assets, their growth or restructuring due to changing volumes of demand for the company's products. However, such an approach to the investment activity of an enterprise allows it only to maintain competitive advantages in the short term, but not to manage them in any way. For the management of an enterprise, it is important to understand the need for consciously perspective investment management aimed at the implementation of its innovative programs, on the basis of forecasting its directions and forms, adaptation to the general goals of the enterprise's development and the changing conditions of the external investment environment. The most effective tool for prospective investment management of an enterprise, subordinate to the realization of its innovative development goals in conditions of significant changes in macroeconomic indicators, the system of state regulation of market processes, the investment market environment — that is, the uncertainty of the enterprise's environment, is an investment strategy.

Investment strategy is a system of long-term investment objectives of the enterprise, determined by the direction of its strategic development, as well as the choice of the most effective ways to achieve goals.

In essence, an investment strategy is the main direction of the entire investment activity of an enterprise, following which in the long term should lead to the achievement of the goals of the strategic development of an enterprise, the implementation of innovative programs of an enterprise and obtaining the expected investment effect. The investment strategy determines the priorities of the forms and forms of investment activity of the enterprise, the nature of the formation of investment resources and the sequence of stages for the realization of investment goals ensuring the management of the competitive advantages of the enterprise on the planning horizon. Her role is in the functioning of the enterprise and a close relationship with other strategies that together form its economic strategy. Of the various areas of strategic decision-making, the central place is occupied by the commodity-market (marketing) strategy, which, as a rule, largely induces appropriate strategies and decisions in other areas (technical, social and managerial). However, these decision-making areas can also be implemented autonomously. The investment strategy can be considered a link of the entire integrated economic strategy of an enterprise, since the implementation of commodity-resource, technical, social and other components of an integrated strategy of an enterprise requires support in the form of a set of basic decisions in the field of investment [Fig. 2].



Fig. 2: The hierarchical structure of the division of the integrated economic strategy of the enterprise.



In the classical sense, the economic cycle includes four phases: Crisis (recession, recession); Depression (stagnation); Revitalization (expansion); Rise (boom, peak). It is worth noting, however, that modern Western economic theory uses a more aggregated division, highlighting two phases: recession and recovery. In this case, a recession is commonly understood as a crisis and depression, under a rise - revival and boom.

CONCLUSIONS

Enterprises that were in the growth or maturity phase before the recession phase are faced with a difficult task of fundamentally restructuring their investment strategy. The difficulty lies primarily in the fact that the change (reduction) in demand is differentiated by strata with different income levels. For the majority of potential buyers of non-production products, such as individual economic agents who are employed, the narrowing of demand is due to rising unemployment, lower wages, of bonuses and other causes of lower incomes. However, along with this category of economic agents, there is a category of highly paid officials, managers, entrepreneurs, leading large and medium businesses, who continue to show demand for advanced and breakthrough expensive products even in the recession phase of the economy.

Similarly, the demand for industrial products for simple and complex economic units (individual firms or concerns) is differentiated. In this case, the stratified demand arises under the influence of the industry of the producers, their compliance with the strategic objectives of the state. Therefore, enterprises that fulfill government orders or receive certain preferences from the state may not "notice" the recession in the economy, since the financial side of their activities is guaranteed by the state. At the same time, industrial enterprises operating in industries unrelated to the realization of the strategic goals of the state cannot count on such preferences. Therefore, the nature of their investment strategy in the recession phase changes significantly - its goal is to provide financial support for the survival of these industrial enterprises. At the same time, the most important task of management in the recession phase is to prepare for the transition to the recovery phase. The recession creates favorable conditions for the acquisition of depreciating assets, the use of which in the recovery phase can significantly increase the level of competitiveness of enterprises.

CONFLICT OF INTEREST

There is no conflict of interest.

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REFERENCES

- Yazenin IA. [2001] Minimal risk and efficiency portfolios for fuzzy random data. XXI Seminar on stability problems of stochastic models. Abstracts, Eger, Hungary. doi:10.1007/s10479-017-2411-9.
- [2] Crowther KG, Haimes YY. [2010] Development of the Multiregional Inoperability Input-Output Model (MRIIM) for Spatial Explicitness in Preparedness of Interdependent Regions//Systems Engineering. doi:10.1002/sys.20130
- [3] Dimitras AI, Slowinski R, Susmaga R, Zopounidis C. [1999] Business Failure Prediction Using Rough Sets European Journal of Operational Research. doi:10.1016/S0377-2217(98)00255-0.
- [4] Juan R, Castro, Oscar Castillo, Luis G, Martínez. [2007] Interval Type-2 Fuzzy Logic Toolbox. doi:10.1109/FUZZY.2007.4295341.
- [5] Nilesh N, Karnik, Jerry M, Mendel. [2000] Operations on type-2 fuzzy sets. doi:10.1016/S0165-0114(00)00079-8.
- [6] Zadeh L. [2002] Toward a perception-based theory of probabilistic reasoning with imprecise probabilities Journal of Statistical Planning and Inference. 105:233-264
- [7] Inuiguchi M, Tanino T. [2001] Portfolio selection under independent possibility information Fuzzy sets and systems. 115:83-92.
- [8] Erdal Kayacan PhD. [2009] Candidate. Contributions to Type-2 Fuzzy Sets. Theory and Applications in Control Engineering and Robotics. 10.
- [9] Beilin IL. [2017] Economic-mathematical modeling of the total costs of innovative chemical enterprise methods of fuzzy set theory. Journal of Engineering and Applied Sciences. 12(19):4865-4869.
- [10] Beilin IL, Khomenko VV. [2018] Theoretical bases of project management in conditions of innovative economy based on

fuzzy modeling. Journal of Physics: Conference Series 1015 (2018) 032013 doi :10.1088/1742-6596/1015/3/032013.

- [11] Beilin IL. [2017] Economic optimization in chemical enterprises International Journal of Economic Perspectives. 11(4):670-677.
- [12] Tardy Yves. [2010] Petrology of Laterites and Tropical Soils. ISBN 90-5410-678-6, http://www.books.google.com/books.
- [13] Dimova L, Sevastjanov P, Sevastianov D. [2001] Fuzzy Capital Budgeting: Investment Project Valuation and Optimization Chenstohova Tech Univercity Proceedings.
- [14] Shang-Ming Zhou, Robert John, Francisco Chiclana, Jonathan M, Garibaldi. [2007] New Type-2 Rule Ranking Indices for Designing Parsimonious Interval Type-2 Fuzzy Logic Systems.
- [15] [2002] Fuzzy Sets in Management, Economy and Marketing.Ed. By Zopounidis C. and oth – World Scientific Pub Co.
- [16] Hua Wang. [2011] Fuzzy Control Systems Design and Analysis: A Linear Matrix Inequality Approach.
- [17] Zimmerman HJ. [2001] Fuzzy Sets Theory -and Its Applications. -Kluwer Academic Publishers.
- [18] Zobel CW, Khansa L. [2012] Quantifying Cyber Infrastructure Resilience against Multi-Event Attacks Decision Sciences. doi:10.1111/j.1540-5915.2012.00364.
- [19] Rose PR. [2001] Risk Analysis and Management of Petroleum Exploration Ventures American Association of Petroleum Geologists, Methods in Exploration Series. doi:10.1306/Mth12792.
- [20] Uziel Sandler, Lev T. [2008] sitolovsky Neural Cell Behavior and Fuzzy Logic. Springer. 478.
- [21] Takafumi N, Fminori T, Kamran MN, Bernardino MC, Alessandro PF. [2009] Practical Equations for the Elatic Modulus of Concrete, ACI Structural Journal. 106(5).

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- [22] [2007] A Novel Algorithm for Tuning of the Type-2 Fuzzy System: Материалы конф. First Joint Congress on Fuzzy and Intelligent Systems Ferdowsi University of Mashhad, Iran, 29-31 августа.
- [23] LeSage J, Fischer M. [2008] Spatial growth regressions: Model specification. estimation and interpretation. Spatial Economic Analysis. 3:275–304.
- [24] LeSage J, Parent O. [2007] Bayesian model averaging for spatial econometric models. Geographical Analysis. 39(3):241–267.
- [25] Kleibergen, Frank, Richard Paap. [2006] Generalized reduced rank tests using the singular value decomposition. Journal of Econometrics. 133:97-126.
- [26] Corrado L, Fingleton B. [2012] Where is the economics in spatial econometrics? Journal of Regional Science. 52(2):210-239.

- [27] Chen, Xiaohong, Demian Pouzo. [2015] Sieve Wald and QLR inferences on semi/nonparametric conditional moment models. Econometrica. 83:1013-1079.
- [28] Fisher M, LeSage J. [2013] A Bayesian space-time approach to identifying and interpreting regional convergence clubs in Europe. Paper presented at 53rd ERSA conference, Palermo. doi:10.1111/pirs.12104.
- [29] Gibbons S, Överman HG. [2012] Mostly pointless spatial econometrics? Journal of Regional Science. 52 (2):172–191.
- [30] Hansen, Bruce E. [2015] The Integrated Mean Squared Error of Series Regression and a Rosenthal Hilbert-Space Inequality. Econometric Theory. 31:337-361.