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Technique of the Analysis and Assessment of Innovative Industrial Risks at Different Stages of Innovative Activity

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ABSTRACT

High rates of innovation in enterprises require setting a number of scientific and technical problems related to the evaluation and analysis of innovative industrial risks and their control systems. The article proposes an original technique for evaluation of innovative industrial risks at different stages of innovation. Its feature is that the rate determined by the survivability of the economic system. The basis of the study developed the method for determining the survivability is the definition of the integral index of vitality based on a comprehensive assessment of the production system. The closer the result of this indicator to one, the better the control system will determine the problem areas in the implementation of innovation and more efficient use of a set of measures to address the problems identified. Methods of assessing and analyzing the vitality of enterprises is available for the purposes of risk management as a tool of analysis to identify reasons for the decline performance of innovation. In this regard, we determined preliminary values of specific factors and the limit values for these indicators.

Keywords: Innovations, Innovative Industrial Risks, Stages of Innovative Activity, Survivability of Innovative Economic Systems
JEL Classifications: E22, G32, G31

1. INTRODUCTION

1.1. Innovative Industrial Risks

The efficiency of today's complex economic systems are in extricably linked to the security of their innovative development, carried out in conditions of dynamic changes in the environment. Practice shows that the basis for the formation of this quality is becoming of industrial risks management of innovative business systems (Gilyazutdinova and Ponikarova, 2009). The complexity and characteristics of the group of innovative industrial risks change over innovation transition from stage to stage. Therefore, the formation of an effective system of management it is advisable to assess the risks of industrial innovation at every stage or phase according to the management tasks and the novelty of the project.

Analysis of innovative industrial risks can be divided into two complementary types: Qualitative and quantitative. Qualitative risk analysis complicated his task - to identify risk factors, stages of innovation under which the risk arises, and then identify all the risks (Cozzani et al., 2013; Romanova et al., 2013).

However, the specific needs of innovative industrial risks for the purpose of control is not only the definition phases of innovation, on which there is a risk, but the moment the direct origin of industrial risk management to address the impact. This complicates the process of qualitative analysis, making it a multi-stage. Quantitative risk analysis is a numerical definition of the size of individual innovation of industrial risks and the overall risk of industrial innovation, based on the most dangerous of them. At the same time for the formation of a control system must determine how various factors influence the risk of origin, what are the probabilities and magnitude of the expected damages, both under the influence of changing the parameters of innovative industrial risks. As a result, it simulated a situation in which there is a risk of industrial innovation. In this model stand out factors that the company should have an impact, and outlines options for management actions. Risk analysis determines its direction, and evaluation provides information about the size of this impact.

1.2. Analysis of Innovative Industrial Risks

Evaluation of innovative industrial risk this is the stage of risk analysis, which aims to determine its quantitative characteristics (Cozzani et al., 2013). As already noted, in the innovation of industrial risk, there are two defining its parameters: Probability of occurrence of the events and the possible extent of damage. There are three main methods of risk assessment for specific processes.

1. Analysis of statistical data generated by the adverse effects of events that occurred in the past, this method is applicable to industrial risks arising from the implementation of simulation innovation, given the nature of innovative changes (Malinovsky, 2000).
2. A theoretical analysis of the structure of causality process, this method is recommended for innovative industrial risks specified at the design stage of the innovation process.
3. Expert approach is implemented in the evaluation of industrial risks associated with fundamentally new (absolute) innovation (George end Tyran, 1993).

These approaches are used to assess industrial risks and are applicable to the said reservations to innovative industrial risks.

The nature of innovation activities carried out in the enterprise, is rarely straightforward. Nowadays quite common innovation "package." "Package" usually includes interrelated innovations, and the innovative industrial risk assessment should be used combination of methods. This allows you to get more accurate information about the safety of innovation and economic system. The result of the risk analysis is a qualitative description of the scenarios adverse situations with a probability of occurrence of each of them (Leveson, 2015).

The existing quantitative analysis is completed estimate the size of potential damage from a variety of scenarios implementing innovative industrial risks. Damage to property in the analysis initially expressed in its natural form, i.e., in the form of loss or deterioration of the objects, then using a technique characteristic of damage can be converted into cash, which is called a loss. This raises the problem of translation losses in the cost of natural form, in particular, jeopardize the health and lives of citizens can also be defined in real terms, but the question of how to adequately assess the cost of injury or death remains open.

The effects of most innovative industrial risks are not limited to any one type of damage, as innovation activities is a complex set of measures affecting all aspects of production of the company, so the total damage is the amount of losses that occur as a result of the risks of industrial innovation.

2. METHODS

2.1. Method of Assessment of Innovative Industrial Risks on the Basis of Vitality

It should be noted that at the moment in the theory of management of innovative industrial risks are not designated an established methodological approach allows us to solve the problem of a comprehensive assessment of survivability of a complex system in terms of its structural vulnerabilities and functionality taking into account the importance of the existing economic system in a complex interrelationships (Nasurdin and Cheng, 2010).

Since the choice of indicators of vitality must meet the requirements of compliance of its semantic content of the definition of survivability, providing systematic research, the availability of modeling and calculation of sensitivity to manipulation at the level of performance, they can choose from to implement on the basis of an integrated consideration of performance management solutions included in the selected set of measures to taking into account the characteristics of their implementation. In the most general form of index is described by the ratio of administrative decisions improve safety innovation development to the total number of decisions.

The closer the result of this indicator to one, the better the control system will determine the problem areas in the implementation of innovation and more efficient use of a set of measures to address the problems identified. Consequently, the unit will be the optimal value of this index. Permitted areas will range from 1 to 0, but the closer it is to zero, the more scattered the event are on industrial innovation enterprise risk (Homutsky, 2006. p. 234). The complexity of this approach lies in the diagnosis and detection of individual administrative decisions of a common set of management measures, which makes it practically impossible to approach the contemporary economy.

The proposed method is based on the definition of the integral index of vitality based on a comprehensive assessment of the production system. This method involves monitoring several Blokov indicators that will comprehensively review the status (level) of the survivability of the object being studied. Depending on the objectives and criteria for calculation of the depth of the research included in the blocks can be carried out both on the elements, subsystems, and the whole object.

2.2. Financial Readiness of the Enterprise for Liquidation of Emergency Situations

The first block of indicators characterizing the financial ability of an object to eliminate the effects of (a measure of the adequacy of the basic stability of the system). This set of indicators to determine the possibility (ability) of the object to cover the full damage arising from innovative industrial risks due to the mobilization of financial resources of the enterprise (own funds):

$$V_{f0} = \frac{F_0}{D_{fe}} \tag{1}$$

Where V_{f0} - Basic stability of the object, implemented at their own expense,

F_0 - Value of own funds mobilized by the enterprise in case of emergencies, rubles,

D_{fe} - Expected maximum value of the total damage occurring in the event of an emergency, rubles.

The indicator reflects what part of the damage the company is able to cover at their own expense. You can count on each type of accident, and you can find the average values for the whole object. The higher the value of this index, the greater part of the money the organization can cover yourself.

$$V_{fl} = \frac{\sum (Fl)}{D_{fe}} \tag{2}$$

Where V_{fl} - The ability to object to the rapid involvement of the required value of borrowed funds,

Fl- value of borrowings, which the company can draw in case of emergencies (H) with the cost of capital, rubles,

D_{fe} - Expected maximum value of the total damage resulting from the implementation of emergency rubles.

The higher the value of this index, the greater the capacity for rapid organization of fundraising. The calculation can be carried out on the totality of the sources of funding, and possibly for each source as a whole.

$$A_v = \frac{F_o}{(1 - F_o)} \tag{3}$$

Where A_v - The autonomy of the survivability of the organization (the ratio of debt to equity required for emergency response [H]),

F_0- The share of own funds mobilized by the enterprise in case of emergencies,

$1-F_0$- Share of borrowed funds are used to account for the company (should) involve emergencies.

The higher the value, the greater the effects of the company can eliminate its own expense, the greater its ability to maintain its level of vitality.

2.3. The Economic Vitality

The second set of parameters determines the level of survivability as a result of administrative actions, which in turn shows the dynamics of changes in the economic vitality of the object in the selected time interval. This allows the system to evaluate the effectiveness of implemented measures to improve its effectiveness.

$$\Delta E_v = \frac{D_{fe}}{(1 - \Delta C_a)} \tag{4}$$

Where E_v - Economic efficiency of changes in the level of survivability,

ΔC_a - The amount of change management costs of disasters, compared with an initial value,

ΔD_{fe} -Changes in the relative value of the total expected maximum damage resulting from the implementation of emergency as a result of changes in the value of the cost of preventing accidents.

The indicator reflects the extent to which the expected loss is reduced, depending on the change of the cost of managing emergencies, invested in the development of emergency management.

$$E_{vr} = \frac{\Delta D_{fre}}{(1 - \Delta C_{ar})} \tag{5}$$

Where E_{vr}- Quality changes in the level of survivability,

ΔC_{ar} - The relative change in the costs of implementing the prevention of emergency situation compared with an initial value,

ΔD_{fre} - Relative change in the value of the total expected losses resulting from the implementation of emergency as a result of changes in the cost of preventing accidents.

The index reflects the ratio of the rate of change of the values of the expected costs and damages that enables you to compare different ways to increase survivability and choose the most effective, and then calculates the average value of the index as a whole object. The higher the index, the higher the quality of the changes taking place in survivability.

$$S_a = \frac{Q_{vt}}{(Q_{vb})} \tag{6}$$

Where S_a - Growth rate of survivability over time,

Q_{vt} - Value the quality of vitality during the reporting period,

Q_{vb} - The value of the quality of vitality in the base period.

This reflects how the persistence of an object over time, the higher the value, the higher the level of vitality of the object.

Quality improved survivability, if the system of risk management is dominated by pre-emptive, preventive measures. This unit shows how money spent on risk prevention at the expense of preventive measures, changing the value (share) of the expected damage. Comparison of indicators over different time periods will determine the quality of vitality and it reflects how the level of survivability due to changes in the quality of security management enterprise through innovative industrial risks.

$$Q_v = \frac{\Delta D_{fp}}{(\Delta C_p)} \quad (7)$$

Where Q_v - Quality of vitality,

ΔC_p - The change in the costs of prevention of emergency situations, rubles,

ΔD_{fp} - A complete change in the value of the expected damage arising in cases of emergency as a result of increasing the number of preventive measures, rubles.

2.4. Willingness of Staff to Emergency Response

The third block describes the willingness of staff to emergency situations and their consequences. This unit is characterized by the ratio of the number of personnel required for the elimination of the consequences to the existing number (Monferini et al. 2013). In this block, it is advisable to determine the quality of staff training, readiness for liquidation of consequences. It is recommended to evaluate this block of indicators specifically for the study of the production system by conducting tests on simulators programs of emergency situations and various exercises.

$$R_p = \frac{N_{se}}{N_e} \quad (8)$$

Where R_p - Training of personnel liquidation of consequences,

N_{se} - Number of employees successfully trained in industrial safety, people,

N_s - Total number of employees required to undergo certification of industrial safety attendees.

$$R_k = \frac{N_{se}}{N_e} \quad (9)$$

Where R_k - The ability of staff to the elimination of the consequences,

N_{se} - Number of employees with training in disaster management, people,

N_e - The total number of staff required for emergency situatsiyna this facility, people.

$$R_a = \frac{SE_m}{SE_{mr}} \quad (10)$$

Where in R_a - The willingness of staff to emergency situations,

SE_m - The number of employees involved in the liquidation of consequences of emergencies,

SE_{mr} - The total number of people involved in the accident.

It is recommended to determine this figure by means of the exercise in the aftermath of emergencies. These measures are in accordance with the importance of each unit ends the definition of the category indicators of vitality and development of a set of measures to enhance its specific to the considered production system. In determining the category of systems is necessary to determine the weight of each unit, taking into account their specific features for the reliable determination of the level of survivability of the system and then refer to a particular level. In this regard, we determined preliminary values of specific factors and the limit values for these indicators (Ferdous et al., 2013).

2.5. Boundary Values of Indicators

To determine the groups of indicators on which the index is calculated integral vitality production and commercial facilities, is necessary to reduce all areas of sufficient and minimum values of the indicators by relating them to the values of specific weights (Mikes, 2011). As a result, the following groups were shown in Table 1.

The first group of indicators presented indicators of financial vitality of the object (V_{fo}), the ability to object to the rapid involvement of the required value of borrowings (V_{fl}) autonomy and vitality of the organization (A_v). The upper limit of the first indicator is not defined, however sufficient amount of own funds recognized in the presence of the enterprise from its own funds to cover the maximum expected damage from an accident (equal to 1) and the minimum value of −0.5. The range of values of the second indicator is similar to the first. The third indicator is a valid value at the value of 1, and the minimum −0.5. All three indicators have maximum value.

To determine the integral index of financial vitality necessary to add all these values and adjust them for the value of the share of the importance of each indicator in the general level of financial vitality. The importance of financial survivability is based on peer review specific ratio with a value of 0.4. The share for the first indicator in this block is (according to the results of peer review) 0.4; second - 0.3 for the third - 0.3.

The second group of indicators determines the quality of vitality by calculating the following criteria: Cost-effectiveness of changes in the level of survivability (E_v), the quality changes in the level of survivability (E_{vr}) and growth rate of survivability over time (S_a). Adequate value of this quantity will depend on the effectiveness of the installed for a particular system. For the calculations in the petrochemical complex of recommended value of 0.2, which implies a 20% increase in efficiency in the changing costs of 1%, the minimum value should be equal to 0.01. At the same time the importance of the second group is based on peer review specific ratio with a value of 0.3. The share for the first indicator in this block is according to the results of expert assessment of 0.3; second - 0.4 for the third - 0.3.

The third group of indicators include training of personnel forms, methods and techniques for the elimination of consequences (R_p), the ability of personnel to eliminate the consequences of (R_k) and the willingness of staff to emergency situations (R_a). The upper limit is determined by the first indicator 100% engagement and security personnel of the enterprise liquidation process of the accident (set to 1), and the minimum value of - 0.5. According to the expert assessment of the proportion of the first indicator is 0.3; second - 0.4 for the third - 0.3. At the same time the importance of this group of indicators defined by the specific ratio with a value of 0.3.

2.6. The Criteria for the Level of Survivability

As part of this method have been proposed in the criteria for determining the general level of vitality and the corresponding level of quality management systems with innovative industrial risks (Table 2).

Overall, the analysis of the survivability of complex production systems will identify problems in the management of the safety of their innovative development. The study of the dynamics of the proposed indicators, taking into account these factors allows to adjust the selected strategic direction of formation of effective management of innovative modernization of the productive capacity of enterprises.

3. RESULTS

3.1. Evaluation of Survivability of the Enterprise

Evaluation of innovative processes that determine the vitality of production and economic systems, is an integral part of innovation management in the enterprise (Boly et al., 2014). To test the method was assessed level of survivability of a petrochemical complex ("Company 1"). According to the annual report [312], as well as the analysis of safety data sheets and safety declaration of the organization, data were obtained for the calculation of the level of survivability.

Based on the calculations of the value of a particular algorithm survivability for the previous period is - 0.284.

The values calculated indicators and standards - Table 3. The final value of the vitality of the groups is the value of 0.123 for the first group, 0.103 - for the second and 0.105 - for the third. The total value of the vitality of the value 0.331. According to the boundary values of the state of "1 Enterprises" can be attributed to the first category of survivability.

Table 1: The share values of indicators and their limit values

Value	Group I performance indicators (group specific weight 0.4)			II Group of indicators (group specific weight 0.3)			III Group of indicators (group specific weight 0.3)		
	V_{fo}	V_{fl}	A_v	E_v	E_{vr}	S_a	R_p	R_k	R_a
Minimum value	0.5	0.5	0.5	0.01	0.01	0.01	0.5	0.5	0.5
Adequate value	1	1	1	0.2	0.2	0.2	0.9	0.9	0.8
Average value	0.75	0.75	0.75	0.1	0.1	0.1	0.7	0.7	0.7
Specific weight indicator in the group	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.4	0.3

Table 2: Limit values of levels of vitality, their description and their corresponding quality management system innovation of industrial risks

The level of survivability	The range of values	Description
Critical	<0.35	The system is not ready for an emergency, in the event of disruption of the process of life will have to restore the system by means of external tools and resources (state), low quality of management of innovative industrial risks
Moderate	0.35-0.56	The system is ready for an emergency, but if the violation will have consequences in the range of more than 50% of the most dangerous events, the vital functions of the system should be restored with the help of external tools and resources (state), a valid quality innovative management of industrial risks
Normal	0.56-0.76	The system is ready for an emergency, but only if the violation will have consequences within the most dangerous predicted events, the vital functions of the system will be restored without the involvement of external influences, the average quality of the management of innovative industrial risks
Steady	0.76-1.36	The system is ready for an emergency, and it transforms the rate of change of the most dangerous scenarios, while maintaining the capacity for survival with the changes of the external environment, high quality of management of innovative industrial risks

Table 3: Values of indicators to measure the level of survivability "Companies 1" for activity data for 2011-2012

Value	Group I performance indicators (group Specific weight 0.4)			II Group of indicators (group Specific weight 0.3)			III Group of indicators (group Specific weight 0.3)		
	V_{fo}	V_{fl}	A_v	E_v	E_{vr}	S_a	R_p	R_k	R_a
Minimum value	0.5	0.5	0.5	0.01	0.01	0.01	0.5	0.5	0.5
Sufficient value	1	1	1	0.2	0.2	0.2	0.9	0.9	0.8
The average value	0.75	0.75	0.75	0.1	0.1	0.1	0.7	0.7	0.7
Estimated value	0.31	0.16	0.45	0.27	0.38	0.37	0.22	0.22	0.66

This means that the system is not ready for an emergency. And, in the case of disruption of vital processes, it should be restored with the help of external tools and resources (government). According to the analysis, the company is not ready financial implications of the emergence of large-scale violations (especially accompanied by the mass destruction of people to 12 thousand people). This indicates inefficient diversification risk management strategies. Under the conditions as survivability is stagnant encouraged to use insurance instruments (both voluntary and compulsory insurance) to improve security organization funding to eliminate the consequences of the possible risks and restore its functioning.

It should be noted that the enterprise development and selection of management actions occur effectively with sufficient impact (Lampel et al., 2014). However, their number according to the study is not enough to compensate for the possible danger. In addition, found an extremely low willingness of staff to the elimination of the consequences, is their low susceptibility to administrative influence in the implementation of integrated risk management. With a sufficient degree of accuracy it can be said that this is due to inefficient methods of administrative influence.

In this regard, the organization recommended to restructure the system of management of innovative industrial risks for staff adaptation to the continuous development of safety management, the conservation of the quality of the implementation of management activities and increase their number in the new management model and use opportunities to attract additional financial instruments. It should be emphasized that the developed method of determining the level of survivability of the enterprise should be the indicator of the ability of the enterprise to eliminate the consequences of its own in the event of an emergency. At the same time made calculations using the methodology developed in the "Companies 1" showed that the effect of preventing the collapse of damage as a result of the measures taken on the basis of the proposed method was about 400 million rubles.

3.2. Analysis of Survivability of the Petrochemical Complex

Further, for the purpose of research testing methods carried out on the basis of other petrochemical complex based on data from annual reports submitted by the companies on the official site and these certificates and declarations of industrial safety, the results are presented in Table 4. An overall analysis of these organizations has shown that the growth figures for the "Companies 1" and "Companies 3" is due to the introduction of innovative management of industrial risks. The level of survivability "Companies 4" rose by a more active use of the previously implemented a strategy of diversification and a number of measures to manage industrial risks of innovative activity in the part of the selection of innovative projects. However, according to Table 4 are low values of the third group of indicators that characterize the willingness of staff to the emergence of disturbances.

However, according to Table 4 are low values of the third group of indicators that characterize the willingness of staff to the emergence of disturbances. This means that the system of management of innovative industrial risks need to improve efficiency in the field of human resources development component, which may further reduce the quality of the growth vitality of particular significance in view of security personnel for the development of innovative enterprises.

4. DISCUSSION

4.1. The Use of Techniques at Different Stages of the Innovative Activities

This method of analysis was used in the evaluation of innovative control systems of industrial risks in the classical scheme of the innovation, when the whole process takes place within the framework of the economic system and innovative industrial risks can be identified at birth, and even when they are managed within the overall development strategy of the business entity. However, it is as simple as comparing the extent of the effects of exposure to the provision of management and after. However, for the scheme, in which the development of innovative ideas transmitted to the external environment and the ability to manage emerging innovative industrial risk in the economic system will only appear on the stage of implementation of innovations, the main task of management measures becomes the formation of the ability to resist the economic system possible disturbances in the process of innovation and undergo a bifurcation point innovative development. Therefore, when assessing the risks at the selection stage of the project it is necessary to correlate the value of the system with the ability to maintain their function at the point of bifurcation of innovation development, i.e., determine the survivability of the economic system (Kafka, 2014).

However, even a simple assessment of the survivability of modern systems is a very serious problem because of the high complexity

Table 4: Values of the evaluation level of survivability enterprises petrochemical complex of the Republic of Tatarstan on activity data for 2013

Value	Group I performance indicators (group specific weight 0.4)			II Group of indicators (group specific weight 0.3)			III Group of indicators (group specific weight 0.3)			The company
	V_{fo}	V_{fl}	A_v	E_v	E_{vr}	S_a	R_p	R_k	R_a	
Minimum value	0.5	0.5	0.5	0.01	0.01	0.01	0.5	0.5	0.5	
Sufficient value	1	1	1	0.2	0.2	0.2	0.9	0.9	0.8	
The average value	0.75	0.75	0.75	0.1	0.1	0.1	0.7	0.7	0.7	
Estimated value of "Companies 1"	0.31	0.16	0.45	0.27	0.38	0.37	0.22	0.22	0.66	0.331
Estimated value of "Companies 2"	0.49	0.61	0.83	0.22	0.33	0.32	0.33	0.36	0.54	0.4609
Estimated value of "Companies 3"	0.27	0.2	0.43	0.26	0.35	0.33	0.32	0.34	0.55	0.333
Estimated value of "Companies 4"	0.45	0.4	0.51	0.24	0.30	0.28	0.31	0.29	0.53	0.3744

of data objects. In addition, the formation of methodological basis of certain vitality involves consideration of the characteristics of complex systems, the analysis of which is carried out (Miorando et al., 2014). Thus, the construction of this indicator for the information and automation systems, it is advisable to carry out based on its definition given in ISO 34.00390 (Dubrov et al., 1999). Determination of vitality in this case concentrated on the evaluation of adaptability as the ability to change the system to maintain their operating characteristics within the specified limits when the external environment (Khabibullin et al., 2011). In the case of complex technical systems based on the calculation method of survivability assessment is a certain accumulation of damage and the safety margin, which is used to determine compliance with the technical basis of the ability to quickly restore the ability to perform specified functions after injury in normal and abnormal situations. The persistence of social systems can be assessed on the basis of determining the level of exposure time or disturbances in which it can preserve the relationship in the organization of the joint life of people.

Household systems are inherently complex, and include all components of the above systems. In this regard, given the high complexity and comprehensive nature of the problem of survivability analysis of economic systems, assess their condition only on the basis of a parameter is extremely difficult. Therefore, when analyzing the need to use some indicators that use both quantitative and qualitative assessment of the survivability characteristics of industrial and economic objects.

4.2. Current Approaches to the Evaluation and Analysis of Complex Systems Survivability

The study of modern approaches to the analysis and evaluation of complex systems survivability revealed that in the works of many researchers detail the approaches to the assessment and management of the property of the survivability of systems based on the construction of logical and probabilistic models using probabilistic and deterministic performance (Sultanova, 2008). In most studies of particular importance given to the assessment of survivability of systems in terms of structure and its construction allows one to reliably determine its performance. For Stekolnikov (2002) developed several techniques applicable for associative, associative and structural and structural systems, which take into account their connectedness. However, in this study with the evaluation of the system is not given due weight to the value of existing relationships in the system. The paper (Kochkarov, Malinetskii, 2005) this disadvantage is eliminated, but their proposed methodological approach does not provide for assessment of the ability of the whole system to function after its damaging effects on the elements that are not taken into account the extent of the damage.

The methodology proposed in Kazakov (1977), designed to assess the vitality of systems in terms of its functionality based on hierarchical relationships. The disadvantage is that the structural aspect of vitality represented by only one species relationships to the same without regard to their significance.

To analyze the economic vitality of the system is possible by evaluating the quality parameters of its functioning in the conditions of the emergence of innovative industrial risks in the process of modernization of productive capacities. In this case, the quality of its system functions can be evaluated by the following characteristics:

- Matching functions of the system with its goals and objectives in the disturbing actions.
- Performance and safety of the system and its individual subsystems in the implementation of innovative changes.
- Subsystems and functional readiness of the structural elements and the system is ready for the changes associated with indicators of response (response time) on the disturbing actions.
- The quality of service of subsystems and components control system in the event of changes and disturbances.
- Efficient use of resources, which is estimated from the position of factors, methods for determining the cost of the innovative system reliability.

However, for many enterprises in terms of innovation are important only the direct effects of the adverse effects, namely the state of the system immediately after the adverse impacts. Then assessed a level of performance and level of functioning at a certain time (evaluation of survivability as). For other companies perform the specified functions occur within a certain (and possibly) a long time after the completion of adverse effects. In such systems, the success of the job is determined not only by the state of the system at the initial time, but also in the future trajectory of the operation. In this case, the vitality must be judged by the results of the job. For the petrochemical complex as hazardous production facilities, decision making in the field of innovative industrial risk analysis can be considered through the assessment of survivability that required the development of a methodology for the assessment of survivability of enterprises (Khabibullin et al., 2011).

5. CONCLUSION

The method of estimating the vitality of enterprises takes into account the environment in which to innovate today, and aims to increase the level of safety of the enterprises and the speed of their transition to innovative development and requires a new approach to the management of industrial risks. The peculiarity of the new approach (Rodney, 2015) to the management of innovative industrial risks with the analysis and evaluation of survivability of the enterprise is to determine the importance of each block parameters, the weight of each unit, taking into account their specific features and design stage of innovation (anticipatory control). Identifying features innovative industrial risks and provide targeted impact on them in order to increase the survivability of the object forms the unique character of the proposed management model.

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