The model of control of reliability using the parameters of survivability in terms of innovation

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Abstract. Research of modern processes of ensuring reliability of innovative development become more and more actual recently as more and more often the organizations should make decisions in the conditions of the growing uncertainty. This creates the need for new approaches in the study of management of innovative reliability of economic systems and their search for new mechanisms and tools to achieve it. According to the authors, one of the tools of such management in modern conditions can be structural and functional survivability. It can be used to determine the most effective innovative projects for organizations, taking into account their internal characteristics and the specifics of changes in the external environment. In addition, the dynamics of the values of this integral indicator allows us to assess the effectiveness of management decisions, allowing us to consider it a regulator in the model of innovation management of economic systems. This model, along with internal factors, assumes some change in the existing institutional environment. It is proposed to implement it on the basis of the principles of open innovation, in order to increase the efficiency and security of innovative development of modern companies.

Continuous quality change of modern economic systems development led to formation of new system properties necessary for effective implementation of innovative activity. New abilities of economic systems become the basis of their competitive advantages in terms of innovative economics and define the development speed not only of separate production and economic objects but also their integrated units. It is referred to innovative liability.

Therefore, innovative liability management processes as a basis of innovation effectiveness are one of the main directions in strategic management of innovative development in modern companies. The central stage is also given to problems of formation of innovative liability management model in economic systems. Innovative liability management is a series of actions chosen according to specific information about system and aimed to reach and maintain needed level of system innovative properties in the

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process of its development, all of these achieved by virtue of systematic control and influence on terms and factors that have an impact on liability [1].

Survivability of innovative economic system directly depends on peculiarities of modern mechanism of innovative activity in national companies. In fact, introduction of innovations along with increasing innovative level of economic system production potential is also leading to innovative industrial risks. In their turn, innovative industrial risks expose the characteristics of production economic object and define its survivability.

One of the peculiarity of innovative activity within national companies is the fact that their implementation of innovative activity is discrete and inconsistent and do not include mechanisms of interaction between old and innovative elements, which leads to system malfunctions and decreases its functional survivability, which might lead to emergence of innovative industrial risk. This fact reflects on the ability of economic system further to implement innovative activity and as a result leads to decrease of innovative liability.

It is also worth noting that the implementation of innovative projects by economic systems leads to some changes in interactions between production potential components due to their unbalanced development, which leads to emergence of innovative industrial risks of structural level. Inability of management system to adapt to new conditions leads to decrease of structural survivability and has negative impact on innovative liability. The great importance is given to a fact that companies mostly purchase foreign innovations. They often purchase them without complete scientific technical support, without know-how, due to complications with financial means. It causes big problems in the process of introduction and implementation of innovations and increases a possibility of industrial risks.

The analysis results of these processes in the Republic of Tatarstan allow to form the main direction for structural changes in petrochemical complex in order to increase structural survivability:

- balanced update of production structure taking into account all peculiarities of structure components. This will reduce risks of structure forms nonconformity within production structure and increase balance of its internal development, structural survivability and internal innovative sensitivity;
- management system development through increase of personnel competence, level of innovative culture in petrochemical companies, including among top managers (instrument of management for innovative structural shifts and safe management optimization) and increase of management determination to decisions optimization, including safety of innovative activity;
- development of organizational structure of sector complexes taking into account its place in technological chain and constant monitoring of structural changes and its transformations in order to maximize the effectiveness of management system for innovative structural shifts, use of special institutes accumulating information about innovations and perturbations and helping companies to balance the innovative development of various components;
- Development of personal base for developing innovations in order to increase complex innovative liability, implementation of personal R&D within the process of innovative development and making it continuous and safe for the purpose of increasing intensiveness of these processes in terms of changing environment structure;
- Use of information component in order to increase effectiveness of R&D in innovative structural shifts management, formation of united system for monitoring and automatic accumulation of information about character, intensiveness, safety and direction of innovative development in sector complex in order to increase their survivability and effectiveness of harmonization processes;

- Attraction of technological parks, science centers and scientific research institutes to the process of innovative structural shifts management to analyze and evaluate the structural shifts management system, its effectiveness and working out the ways of its optimization.

The implementation of given directions for structural changes must lead to structural survivability growth of economic systems and serve as a basis for increase of their innovative development safety. Since the existing management system is unbalanced in innovative changes and influenced by changing environment, the increase of structural survivability will partly define the improvement of innovative activity safety, i.e. its functional survivability.

Moreover, such direction of structural changes in economic systems suggests development of alternative means (version of alternative strategies of innovative production risks management) considering assumed versions of changing conditions of safe innovative activity in companies. It allows them to implement strategic planning of management system for innovative industrial risks on early stages of innovative process, which also assists increase of system functional survivability.

Thus, suggested management system for structural changes of economic systems helps to increase their structural survivability and increase effectiveness of innovative industrial risks management system due to new quality of forming connections. This will lead to growth of innovative activity safety and increase of its functional survivability.

Fig. 1 Model of targeted management of economic systems innovative liability

Fig. 1 represents a model of innovative liability management along with controlling its survivability that was developed on the basis of research results. It is based on evaluation of industrial risks management system originated in the process of production potential modernization of economic system. The model shows that

innovative liability management process starts due to control of quality changes of production potential components and connections between them. Its effectiveness is characterized by state of system's functional and structural survivability. Formation of balanced structure of connections between components on the basis of management improves innovative activity safety. Balance and safety of these processes of production potential modernization form the basis for innovative liability of economic systems. In terms of effective management of innovative activity innovative liability should grow at cost of sensitivity of innovations and innovative activity, increasing results of economic system innovative development, which is achieved by complex increase of system survivability. For this reason the suggested actuation device (controller) is changing level of survivability on the basis of monitoring as a criterion of innovative project selection with account of innovative character of economic system. The model implies that the projects evaluation defines a moment of innovative industrial risks emergence to show targeted management perturbation in order to increase system survivability and its innovative liability on the stage of project planning, which makes this model targeted and advanced. Innovative activity security system is changing under influence of general innovative development processes due to changing conditions and directions of modernization of production potential (survivability state). This leads to necessity of changing the entire system of innovative liability management in order to remain the innovative activity effective, which makes it dynamic.

Most of the companies do not have adequate resources for designing their own innovative projects due to some processes of modern development, that is why in order to increase the speed and effectiveness of innovations initiative impulse for innovative activity is formed within technological core that is some combination of technologically connected economic systems. It can be some institute of innovative activity: tech parks and technopolises, scientific research centres working on production of novelties.

The entire complex of relations between people taking part in economic processes is controlled by the body of rules, i.e. corresponding institutes. Objects of control and regulation are relationship and interactions between production participants within production economic objects and relations between them within a matter of their cooperation and exchange processes. Norms and rules define methods and ways of producing novelties and using innovations in the process of effective development of economic systems; interaction between production economic objects within integrated structures in the process of innovation.

Innovation system is a body of institutes defining a possibility of producing novelty and conditioning its transformation onto innovative product or service and further distribution. It includes particular participants of innovative process as well as set of specific conditions, factors, methods and principles of organization and stimulation of innovative activity.

Institutes structure the interaction between economic agents and form the innovative character of their activity. Institutional environment frames innovative activity as economic entities as well as economic systems of regions and national economy in general. This environment is one of the most important conditions of successful exchange of technologies. It makes technological, economic and innovative development of economic systems and economic entities compatible with each other, including technologies suppliers and receivers. In her research Gilyazutdinova I.V. notices that institutional environment structures the body of rules which regulates the internal activity of economic entities and their interaction with each other. Accordingly in the work of this author the activity of economic entities is considered on the basis of such approaches as transformational and transactional [2].

In economical literature internal institutes are viewed as considerably stable internal attributes of research subjects. They are driving force of innovative changes in economic

entity and they form its behavior. This implies study of economic system through its system of rules, agreements and contracts expressed in managing approaches for innovative activity based on its safety priority. Innovative liability formation is conditioned within these institutes. External institutes cannot be considered as components of researched subject, because they change considerably slower than subject of research that they frame. For this reason they are used as instruments of studying rules of interaction between economic entities in the process of implementation of innovative activity.

New terms of economy require new approaches to form internal institutional environment. The special place among internal institutes of economic systems goes to institutes of innovative activity security management which are responsible for reflection of innovation security principle on the system mission, designing appropriate innovative strategy, defining the aim of production of new knowledge with account to their ambiguous influence on economic system.

Analysis of institutional factors of innovative liability increase is incomplete without considering the mechanisms of interaction between internal institutes of this process. These interactions are result of innovative activity of economic systems. They are carried out within institutional system and directly influenced by it. Institutional system of economy is a defined form of combination of formal and informal, normative and organizational institutes closely connected to each other and interdependent. According to subject of research, normative institutes determine general rules of behavior in the sphere of innovative development security, sizes and properties of organizational structures, effective organizational localization of interfaced economic chains, mechanisms of coordination and subordination within management of innovative industrial risks [3].

Organizational institutes on their turn provide financial background for implementation of established norms: formation of financial readiness to increase innovative liability, creation of background to manage innovative industrial risks on the level of planning, development of strategy for providing economic system survivability on the basis of increasing effectiveness of industrial risks management, use of normative prerequisites to coordinate contingency and balance of modernization of production potential components.

Change of institutional conditions of economic system innovative development can go two different ways. First of all, the process of innovative development implies reconstruction of old organizational economic forms of activity (organizational institutes) and formation and reinforcement of new organizational structures and absence of coordination mechanisms leads to decrease of survivability due to emerging uncontrolled stochastic effect. However, this process takes a lot of time due to incomplete radical transformations of normative institutes and their formal fixation, it is accompanied by various transient immature organizational economical forms that decrease innovative liability due to continuous unsettled perturbing actions.

Secondary is the path of substitution and displacement of old institutes by institutes of a new type. However, this path is organized on the basis of controversial interaction between old and new transplanted institutes and it may cause deep conflicts and contradictions which demand mechanisms of harmonization and adaptation for their solution. In other word, as it was noted by I.V. Gilyazetdinova, incompatibility of introduced institute with cultural traditions and institutional structure of economic system in case of “shocking” technology may cause the emergence of transplant dysfunctions: atrophy and rebirth of an institute, rejection as a result of activation of alternative institutes, institutional conflict [4].

All of the above will lead to loss of effectiveness of institutional conditions alterations. The first path seems to be more preferable, even though it is longer, but it cannot take too much time, otherwise it may have negative effect like the second one.

Considered all, the introduction of organizational innovations stimulated by various changes at first contributes to adaptation of functioning organizational structures to ongoing

changes, but then requires the quality change of organizational economical components wholeness which implies cardinal change of their construction principles. One of these principles is an approach to increasing innovative liability of economic system by virtue of increasing of effectiveness of innovative development security management. We need to mention that in terms of growing complication of economic interrelation and strengthening of contingency of economic chains functioning the process of interpenetration and consolidation of organizational structures gets accelerated development, that is why the process of cooperative interrelation has to be institutionally framed on time in new normative institutes [5,6]. If it is not done on time, it might cause “institutional abruption” (between organizational economical institutes and normative institutes) that prevents the implementation of technological innovations, transformation of separate technical organizational changes in the system, introduction of organizational innovations packages and establishment of new type of economic systems.

However, the character of suggested changes of institutional conditions implies formation of instruments to overcome these abruptions by means of parallel development of normative and organizational institutes on the basis of complex management of innovative activity security. Thus, institutional structures appear to be bigger resource of increase of innovative development liability of economic systems.

But in this case the process of innovation creation has to be based on the results of analysis of economic systems peculiarities in its turn developed on the basis of defining existing level of survivability and assumed dynamics of its changing. It requires changes in institutional conditions for innovative development and implies introduction of new organizational forms into the complex structure that assist to increasing of effectiveness and security of innovative development [7,8]. Informative richness in particular needs new institutional caches – informative bases for each economic system that receives information on system survivability reactions to various innovative projects and processes and to means of its management.

The information of these bases becomes the core for developing or selecting projects and for the system of secure innovative development. Approbation of innovations especially of absolute novelties is carried out in smaller, but technically similar, companies. Large-scale enterprises may have few such polygons reflecting particular aspects and peculiarities for primary implementation of novelties. It decreases potential innovative industrial risks of structure and functioning of economic system with the help of information about possible complex of risks. Such groups of companies can be defined as information sites which form informative caches for scientific technical centers and internal management of innovative liability on the basis of survivability. The scheme of management is illustrated in the picture 2.

Fig. 2. Diagram of innovative liability management in economic systems with consideration to changes in institutional factors

Several economic systems may have one information cache, which increases the level of this information base and improves the quality of decisions made on its basis. But it is possible only in case of informative disclosure and high level of informative technologies and communications. Concerning economic systems of meso level and higher the scientific-technical core may be placed within the system, but it also may worsen the quality of project decisions due to loss of objectivity in information evaluation. Thus, suggested management decisions help to increase economic system innovative liability and to improve results of their innovative development.

Based upon general tendencies and characteristics of petrochemical companies development the model of innovative liability management can be identified as a complex dynamic model of targeted impact oriented to increase of innovative activity effectiveness on the basis of its secure implementation. The study leads to a conclusion that innovative liability management must be systematic and has to be carried out during all stages of innovative projects introduction.

However, maximum effectiveness implies advanced management of innovative industrial risks in order to increase economic systems survivability in the process of balanced modernization of production potential. Within the given study we can suggest following strategic directions aimed to increase the effectiveness of complex innovative development and that must be implemented in interaction with each other:

- balanced update of production potential components considering the level of economic system readiness to innovations. This will reduce risks of nonconformity of various structural connections within economic systems, help to increase harmony of internal development of production potential components and lead to increase of system survivability;
- development of management system due to improvement of personnel qualifications, level increase of innovative security culture in companies, including top managers, increase of determination of management means to optimize decisions which in terms of secure implementation of innovative activity leads to growth of innovative liability;
- development of institutional environment of innovative activity, formation of new organizational forms within complexes for continuous monitoring of

changes in economic system survivability in order to maximize the effectiveness of innovative activity management system, use of companies and special institutes that accumulate information about innovations, corresponding risks, that improve effectiveness of their management system;

- creation of personal base for innovations development in companies in order to implement advanced management of innovative industrial risks at the stage of innovations planning, formation of conditions for open innovations, making innovative activity continuous and secure, increase of intensiveness and controllability of these processes in terms of environment changing environment;

- use of companies informative component as a controller of innovative activity security for purposes of increasing effectiveness of R&D in management of economic systems development, formation of united system of monitoring and automatic accumulation of information about character, intensiveness and safety of economic systems development during implementation of various information projects in order to increase their survivability and innovative liability.

Thus, in our opinion, the regional support in these strategic directions will help to implement secure innovative development in petrochemical companies which will increase their innovative liability and pace of effective innovative activity of the Republic of Tatarstan given the fact that petrochemical complex in republic's economy.

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