

The university integration management model in the national innovation system

El modelo de gestión de la integración universitaria en el Sistema Nacional de Innovación

Gennady Innokentevich LAZAREV [1](#); Svetlana Valeryevna KRIVOSHAPOVA [2](#); Vyacheslav Gennadevich KRIVOSHAPOV [3](#)

Recibido: 26/10/2017 • Aprobado: 25/11/2017

Contents

- [1. Introduction](#)
 - [2. Methods](#)
 - [3. Research results](#)
 - [4. Discussion](#)
 - [5. Conclusion](#)
- [References](#)

ABSTRACT:

Any modern state distinctly associates its viability and development with science-based innovation activity. This state of affairs, in its entirety, embodies the notion of national innovation systems. Among the numerous elements of the national innovation system, providing a contribution to innovative development, certain place is occupied by higher education institutions (universities) and their scientific activities. However, not every university can be equally qualitative and effective element of the national innovation system. Therefore, it is necessary to have available certain ways to improve the integration of the university. The integration enhancement process should be regulated by a management system that meets the integration conditions. The management system could be created based on developed model for university integration management into the national innovation system (NIS). In consequence of the implementation of such a model, it is possible to clearly determine the place of the university in the NIS, and to ensure the adoption and implementation process of managerial decisions to improve the level of integratedness based on the management system. The stronger the university is

RESUMEN:

Cualquier Estado moderno asocia claramente su viabilidad y desarrollo con la actividad de innovación basada en la ciencia. Este estado de cosas, en su totalidad, encarna la noción de los sistemas nacionales de innovación. Entre los numerosos elementos del sistema nacional de innovación, que aportan una contribución al desarrollo innovador, ciertos lugares están ocupados por instituciones de educación superior (universidades) y sus actividades científicas. Sin embargo, no todas las universidades pueden ser elementos igualmente cualitativos y eficaces del sistema nacional de innovación. Por lo tanto, es necesario disponer de ciertas formas de mejorar la integración de la Universidad. El proceso de mejora de la integración debe estar regulado por un sistema de gestión que satisfaga las condiciones de integración. El sistema de gestión podría crearse basándose en el modelo desarrollado para la gestión de la integración universitaria en el sistema nacional de innovación (NIS). Como consecuencia de la implementación de este modelo, es posible determinar claramente el lugar de la Universidad en el NIS, y asegurar el proceso de adopción e implementación de decisiones gerenciales

integrated into the national innovation system, the higher its interaction with other elements of the NIS, and hence the higher its contribution to the development of the innovative economy and the welfare of the state.

Keywords: innovations, national innovation system (NIS), university integration, university environment, integration model, management system.

para mejorar el nivel de integración basado en la sistema de gestión. Cuanto más fuerte se integre la Universidad en el sistema nacional de innovación, mayor será su interacción con otros elementos de la NIS y, por ende, mayor es su contribución al desarrollo de la economía innovadora y al bienestar del estado.

Palabras clave: innovaciones, sistema nacional de innovación (NIS), integración universitaria, entorno universitario, modelo de integración, sistema de gestión.

1. Introduction

Over the recent decades, the foundation of the global economy has undergone considerable changes, most of which were due to the current trends of innovative development and strengthening of globalization. In particular, this situation contributed to the development and wide dissemination of the concept of the national innovation systems (NIS). Each national innovation system is unique in its own way and has its own set of elements. The quality of the integration and interaction of the NIS elements have a direct effect on the level of the innovative economy development and the welfare of the state. Thereby, in the current context of searching the ways of production development and improvement, which are characterized by the development of new and mostly effective forms and methods of doing business, integration into the NIS appears as a qualitative and demanded process predetermining the growth of the effectiveness of any research or production activities.

The degree of elaboration of the stated issue. The issues concerning national innovation system and its constituent elements, principles of operation, functions, as well as the balanced NIS forming practices in economically advanced countries are considered in the works of scholars such as C. Freeman (1987), B.-A. Lundvall (1992), S. Metcalfe (1995), R. Nelson (1993), P. Patel and K Pavitt (1994), et al. To a large extent, researchers have studied the integration of one of the most important elements of the national innovation system, namely higher education institutions (HEI). The issues of university science development, integration and forms of scientific associations, as well as the problems existing in this sphere, are considered in studies of L.N. Ananeva (Smolyanova, Kuznetsov and Ananieva 2010), L.M. Gohberg (2003), G.M. Darbishev (2010), A.V. Kuznetsov (Smolyanova, Kuznetsov and Ananieva 2010), N.V. Plotnikov (2010), E.L. Smolianova (Smolyanova, Kuznetsov and Ananieva 2010), and other scientists.

However, despite numerous studies of theoretical and practical aspects of the national innovation system and its element represented in the form of higher education institution, science has not developed a coherent and uniform approach to the integration of the higher education institutions into the NIS.

2. Methods

The theoretical and methodological basis of the work rests on the developed forms of scientific and theoretical knowledge, namely scientific research and analysis of the studied theories and concepts. To obtain scientific results, we used several methods. A method of analysis and synthesis was used to systematize innovative elements, phenomena and concepts based on the most similar characteristics, as well as to highlight common features of integration into the national innovation system. A method of graphical modeling was used to build the integration management model, and simulation of the elements based on the studied data. The method of induction allowed proceeding from single private statements to generalize study results.

3. Research results

Higher education institutions, as one of the national innovation system's element, have all necessary potential and range of opportunities to contribute to the development of the state and growth of the innovation economy. At the same time, integration processes in education

stimulate the creation of conditions for competitive growth of Russian universities (Lazarev and Martynenko 2006)

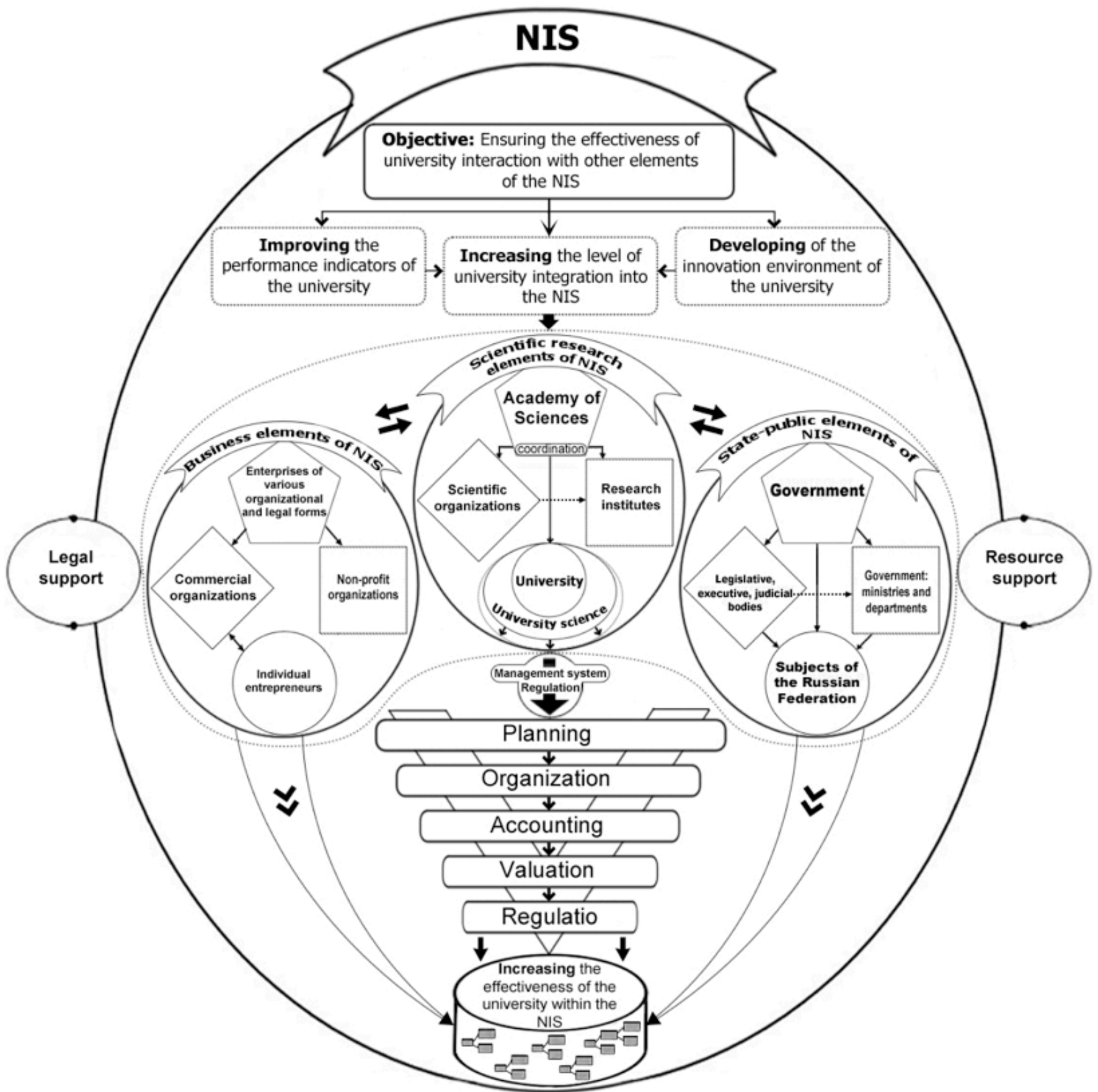
However, the domestic university environment has a number of the obstacles and challenges that require resolution and are negatively reflected on the level of its integration into the NIS. Therefore, it becomes necessary to possess certain ways available to improve the integration into the NIS.

In the latter case, the process of enhancing the integration should be necessarily regulated by a management system meeting the conditions of integration. For this purpose we should first reflect the model of the national innovation system and define the place of the higher education institution in this system as an object of management, as well as to consider its interaction with other NIS elements. Ultimately, in the considered NIS model we should present functions of university integration management that satisfy the conditions of integration.

So, for a more effective and competent implementation of the university integration management system, we have chosen creation and development directions that are able to meet the research conditions presented, as well as model of university integration management into the national innovation system. Our vision of the university integration management model in the frameworks of the national innovation system is based on a representation of the structure, the functioning of which is aimed at increasing the level of university integration into the NIS. Competency-based position of this model is assumed to be a detailed reflection of the totality of the elements that constitute the national innovation system, the determination of the place of the university among them, and consideration of measures to strengthen its influence in concerned system (Fig. 1).

Figure 1

University integration management model into the national innovation system



Consequently, the developed university integration management model into the national innovation system takes into account both all the determined NIS basic elements and the structure of their interaction in the innovation environment. However, the key point that brings novelty to the proposed model is the grouping of the NIS elements in the framework of integrated groups such as business elements, research elements, and the state and public elements of the NIS. The proposed model contains the management system providing the university integration into the national innovation system, which is based on the planning, organizing, accounting, evaluation, and regulation functions.

4. Discussion

The management model of the university integration into the national innovation system is designed to reflect the place of the university in the NIS and ensure the managerial decisions'

adoption and implementation process to increase the level of integration into the NIS based on the proposed management system. The stronger the university is integrated into the national innovation system, the higher its interaction with other NIS elements, and therefore the higher its contribution to the innovative economy development and the welfare of the state.

Consequently, the main goal of the presented model is to ensure the efficiency of interaction of higher education institutions with other elements of the national innovation system.

Achieving the main goal is always associated with the need for achieving certain subgoals. So, according to the present approach, the integration management system includes three subgoals: improving performance indicators of the university, developing research and innovation environment of the university, and increasing the level of integration of the university in the NIS. It should be emphasized that for each higher education institution, which intends to increase the level of integration in the NIS, the goals should correlate with those indicated in the proposed model. The management model of the university integration into the national innovation system must meet the conditions for converting target to the desired eventual outcome. Figure 1 presents the management system in the form of schematic diagram, which shows the sequence of the qualitative transformation of the goal. To achieve these goals, the management system identifies a number of measures.

However, in order for the developed management system to be of a qualitative and objective nature, an important condition is considering the place of the higher education institution as a management object, in the NIS. For this purpose, in the management model of the university integration into the national innovation system, we systematized and schematically presented the elements, which are included in the national innovation system, cooperate with universities, and are able to reflect their place. These include three consolidated groups: business elements, research elements, and state and public elements of the NIS. Such grouping was carried out in the framework of the provisions of the current Civil Code of the Russian Federation (CC RF), RF Constitution and several federal laws, reflecting all persons and state organizations, which can be divided into the above groups.

Business elements of the national innovation system

Consider each group of elements. In the first case, business elements that are part of the NIS, are represented in the form of legal entities, the primary purpose of which consists in carrying out economic activities through the creation of enterprises with different organizational-legal forms. In accordance with the provisions of the Civil Code of the RF, we can distinguish three subgroups within these forms, namely commercial organizations pursuing extraction of profit as the main goal of their activities; non-profit organizations that do not pursue extraction of profit as the main goal, and do not distribute received profit between the participants; and individual entrepreneurs, whose objectives are similar to those of commercial organizations (The Civil Code of the Russian Federation, 1994).

State and public elements of the national innovation system

According to the chosen direction, we consider the second group of the national innovation system's elements presented in the model, namely State and public elements of the NIS. These elements are part of the NIS, which are represented by state power and constituent entities of the Russian Federation. As is seen from Fig.1, State and public elements consist of three main subgroups in the form of state government bodies, ministries and departments, as well as the constituent subjects of the Russian Federation. When developing this group of elements, we were guided by provisions of the RF Constitution, which presents and describes all public elements of the NIS.

Scientific elements of the national innovation system

In the framework of the elements presented in Fig. 1, the last consolidated group includes scientific and research elements of the NIS. These NIS elements involve institutions engaged in scientific and research activities aimed at obtaining and applying new knowledge. In the course

of considering a number of federal laws regulating scientific and research activities in Russia, we have formed a group of scientific elements of the NIS consisting of three main subgroups, namely Academy of Sciences, research institutes, higher educational institutions, and other scientific organizations, which are engaged mainly in scientific activities.

Considering the third subgroup of the NIS scientific elements, we draw more detail attention to scientific research institutes (SRI). Despite the fact that SRIs are part of the scientific organizations subordinated to the Academy of Sciences, their structure consists of many independent specialized agencies that are the NIS elements. The SRIs represent the organizations, the main goal of which is implementing research activities. Currently, in the Russian Federation there are a number of strategically important scientific research institutes, among which we can highlight Scientific Center for Legal Information, Central Research Laboratory of Innovation Technology, Scientific Research Institute of Standardization and Unification, Scientific Technical and Certification Center for Comprehensive Protection of Information, etc. (On approval of the list of state and public organizations, 2004).

As shown in Fig.1, among all elements, certain place is occupied by higher education institutions. Given the general purpose of the proposed model, namely ensuring efficiency of interaction of the university with other NIS elements, we can state that the achievement of this goal can be expressed through specific forms of interaction of the university with the above elements. These forms include creating joint scientific-educational and practice-oriented platforms; creating special university-based classes to implement technological practices; enrolling part-time teachers from real spheres of production to the university academic staff; involving real sector of economy in the development of the curricula, thereby taking into account the actual needs of the labor market; carrying out joint research and development; ensuring involvement of the students in scientific process; establishing joint research centers, technology parks, business incubators; as well as organizing exhibitions, conferences, forums, etc.

Higher education institutions and their regulations may differ from each other. So, it is revealed that despite the fact that the universities are the NIS-integrated elements, the level of their integration in particular cases may be very low, and consequently, their contribution to the innovative economy and the state development in general is also low.

Management system

The quality of the integration depends directly on the quality of made managerial decisions. Thus, a logical step would be designing a management system designed to improve the university performance via managerial decisions, and to insure the efficiency growth of its interaction with other elements of the NIS.

Improving the university integration into the NIS ensures the growth of its contribution to the development of national economy, and consists of a number of factors that are ensured through the implementation of the latest achievements of science and technology into the university environment. In this regard, the university integration management should be based on innovation. Thus, we have chosen the development direction for the management system of university integration into the NIS.

The effective management system formation is the most important scientific and practical task. The system is such a logical grouping of the elements in which each element performs its specific function. Any system consists at least of two elements - managerial body and managed system that is affected by managerial action.

The simplest management system consists of two elements, one of which must be able to impact, while the other one must perceive this impact. In other words, it is always possible to distinguish an object and a subject of management, which are in constant interrelation and interaction in the management system (Chebunin 1999).

The relevant body, i.e. the managerial apparatus of the university integration into the NIS, will

be a subject of management. In this case, the administrative apparatus of the university will be such subject of management. Its tasks include developing organizational and technical measures to increase and ensure the improvement of the university performance indicators, finding the means and methods to achieve the set goals, defining the action plan, and making managerial decisions.

The managed system will include directly the university with its departments, structural divisions, and the administrative body responsible for ensuring activities of the university and its individual components. The adopted action plan will be implemented exactly here, as well as information will be provided to the subject of management regarding the status of the implementation, arising deviations, their causes and the culprits. On the basis of received information, the subject of management conducts analysis making adjustments to the original action plan.

In addition, we should not forget that the management system has a right to exist only in case if it contains management objectives, as well as clearly defined final results. The managerial action of the subject with regard to the object of management is carried out to achieve the goals, which are understood as the desired outcomes. That is, all the parameters that are aimed at improving the integration of the university into the NIS, as well as the integration management strategy, are set exactly when determining the final goals.

One of the conditions providing the achievement of the set goal and management efficiency is the availability of labor force, efficient use of logistical, financial and other resources, without which it is impossible to purposefully manage the production process and provide the required level of product competitiveness and production efficiency. That is to say, a comprehensive interrelation between the goals and resources will allow achieving the eventual outcomes.

In turn, implementing management objectives and achieving eventual outcomes is only possible if the system contains managerial mechanism, which is seen as means to achieve the goals with minimum resources. The managerial mechanism is necessary for the implementation of specific goals, and it includes a number of functions and managerial tools. Managerial mechanism occupies a central place in the management system and serves to bring the system into action and ensure its effective functioning to achieve the set goals and the desired eventual outcomes.

We believe that one of the most important points, when creating a mechanism in the management system, is the identification of functions related to the management of university integration into the NIS. It should be noted that the issue concerning management functions of the university integration into the NIS is extremely poorly researched in innovative practices that is one of the main reasons for the lack of management system applicable for university integration into the NIS.

Thus, due to the absence of clearly identified functions of the university integration management into the NIS, we should consider the basis, which served the outset in the formation of all the major forms and types of management functions in various areas of science. Based on the analysis of economic literature, it was established that the works of Henri Fayol (1992) are the cornerstone in the formation of the management functions. Thus, taking into account Fayol's studies, it is expedient to single out the following measures as the main functions of managing higher educational institutions integration into the NIS.

- *Planning* to improve the level of integration of the university into the national innovation system. This function involves choosing the development directions providing increase of level of integration of the university into the NIS; predicting the future state of the system; defining the action plan; and bringing the program to the object of management;
- *Organizing* management process. This function involves determining necessary resources; identifying resource sources; placing responsible persons and executors; managing the process of the university integration into the NIS;
- *Accounting* for the university integration indicators. This function involves using integration

indicators as the basis to form a set of values; carrying out analysis of integration indicators; and preparing for assessment;

- *Assessment* of the level of university integration into the NIS. This function involves application of the university integration assessment method; obtaining qualitative assessment of the level of university integration; and preparing for regulation on the basis of the results obtained;

- *Regulation* of university integration processes. This function involves analyzing and identifying problem areas; making decision on the current regulation or in the framework of the next period along with the adjustment of the action plan; defining the action plan for the elimination of problem areas; implementation of prepared activities to achieve the eventual outcomes.

Management quality plays here quite important role. As a consequence, management quality is becoming one of the most important areas, and in this case it acquires a distinct utilitarian nature (Vorozhbit, Rodionov and Shashlo 2016).

5. Conclusion

In consequence of consideration of management system functions to improve the level of university science integration into the national innovation system, we can note that these functions can be divided into two blocs. The first bloc includes the initial three functions, which act as the initial steps in the preparation of practical use of decision-making algorithm. The second bloc, consisting of key functions in the management system, provides the assessment and regulation that can be applied in the form of an algorithm. Within these functions it is possible to develop algorithm, which would include the assessment stages of the current level of university integration, and following measures related to the analysis, identification of the problem areas, and adoption the action plan.

As a consequence, educational establishment, which aims at increasing its level of integration into the NIS, can use the proposed management model of the university integration into the national innovation system, having ensured the growth of its educational, scientific, and innovative activities. The performance of highly integrated higher education institution will be raised to the highest level that will qualitatively influence the external objects interacting with the given university, being other elements of the NIS. Large-scale implementation of such practices will have direct impact on the both growth of the national economy and the development of sustainable balanced NIS.

References

Chebunin, P.K., 1999. *Sovremennye metody upravleniya proizvodstvennoj i innovacionnoj deyatel'nost'yu* [Modern management techniques of industrial and innovative activity] [Text]. Ph.D. thesis, Far Eastern State Technical Fisheries University (Dalrybvtuz), Vladivostok.

Darbichshev, G.M., 2010. *Metodicheskie osnovy ocenki i povysheniya ehffektivnosti upravleniya vuzovskoj naukoj* [Methodical bases to assess and enhance the efficiency of the high school science management] [Text]. Ph.D. thesis, Dagestan State Technical University, Makhachkala.

Fayol, H., 1992. *General and industrial management. Controlling*, pp. 29-61.

Freeman, C., 1987. *Technology policy and economic performance; Lessons from Japan*. Frances Printer Publishers, London.

Gokhberg, L.M., 2003. *Nacional'naya innovacionnaya sistema Rossii v usloviyah novoj ehkonomiki* [National innovation system of Russia in the new economy] [Text]. *Economic Issues*, 3, 26-44.

Grazhdanskij kodeks Rossijskoj Federacii [The Civil Code of the Russian Federation] [Text]. Dated Nov. 30, 1994, vol. 51.

Lazarev, G.I. and Martynenko, O.O., 2006. *Tekhnologicheskaya politika i ehkonomicheskie*

- pokazateli; Uroki YAponii [The regional university: Paths of integration in the framework of the Bologna Process] [Text]. Russian Education and Society, 10(48), 32-50.
- Lundvall, B.A., 1992. National systems of innovation. Towards a theory of innovation and interactive learning, Pinter Publishers. London.
- Metcalfe, S., 1995. The economic foundations of technology policy: Equilibrium and evolutionary perspectives. In P. Stoneman (ed.), Handbook of the Economics of Innovation and Technological Change, Blackwell Publishers. Oxford (UK), Cambridge (US).
- Nelson, R., 1993. National systems of innovation: A comparative analysis. Oxford University Press. New York, Oxford.
- Ob utverzhdenii perechnya gosudarstvennyh i obshchestvennyh organizacij [On approval of the list of state and public organizations] [Text]. Decree of the President of the Russian Federation dated Aug. 4, 2004, vol. 1009.
- Patel, P. and Pavitt, K., 1994. The nature and economic importance of national innovation systems, STI Review. Paris.
- Plotnikov, N.V., 2010. Specifika nauki v vuze [The specificity of university science] [Text]. Modern Research of Social Problems, 2, 73-74.
- Smolyanova, E.L., Kuznetsov, A.V., and Ananieva, L.N., 2010. Mekhanizmy integracii vuzovskoj nauki v nacional'nuyu innovacionnuyu sistemu [Mechanisms of integration of the university science into national innovation system] [Text]. Finance, Economy, Strategy, 10, 28-32.
- Vorozhbit, O.Yu., Rodionov, F.V., and Shashlo, N.V., 2016. Mechanism of strategic, politic and process management of universities educational services quality. Journal of Engineering and Applied Sciences, 14(11). Retrieved 24.05.17 from www.docsdrive.com/pdfs/medwelljournals/jeasci/2016/3058-3066.pdf.

-
1. Vladivostok State University of Economics and Service, 690014, Russia, Vladivostok, Gogolya str., 41; E-mail: tatyana.bondarenko@vvsu.ru
 2. Vladivostok State University of Economics and Service, 690014, Russia, Vladivostok, Gogolya str., 41
 3. Vladivostok State University of Economics and Service, 690014, Russia, Vladivostok, Gogolya str., 41
-

Revista ESPACIOS. ISSN 0798 1015
Vol. 38 (Nº 56) Year 2017

[Índice]

[In case you find any errors on this site, please send e-mail to webmaster]

©2017. revistaESPACIOS.com • ®Rights Reserved