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Selection of priorities for innovation development of the region: Russian experience

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Executive summary

Modernization affects national economy and management, as well as the culture and formation of Russian society values system; to launch full scale modernization the society has first to select the priorities for innovation development and identify methods of its implementation. Economic restructuring based on innovative principles is a key issue on the agenda of almost all the Russian regions. It predetermines competitiveness of regional economies, constant growth of proportion of high-tech sectors and industries, and accelerated growth of production of major innovative products. Elaboration of strategic objectives in innovation process is directly related to the development and implementation of regional innovation policy and selection of priorities for innovation development of the region, serving as the benchmark for major policy initiatives. It is necessary to reach consensus on development objectives and tools instrumental to achieving these objectives, as any other program can cause rejection and lead to unintended negative consequences. A special class of methods, combined by term "Foresight" is used for solving such problems. Modern Foresight approaches generally mean the organization of a systematic assessment of long-term prospects for development of science, technologies, economy and society in order to identify strategic areas of research and technologies that can bring the greatest social and economic impact.

Foresight projects are efficient practical instrument, which facilitates improving the efficiency of decision-making at national and regional levels. These projects take into account many different factors and define the results of their joint activity. The article reviews the overall organization of Foresight process at the regional level with classification adjusted to the region type, economic situation in the region and overall regional strategy. The case study of an old Russian industrial region – Bashkortostan republic – is further presented, a pioneer Foresight study undertaken in the region is used as an illustrative approach allowing for useful incorporation of Foresight into the regional R&D management and planning.

1 Introduction

The problem of modernization and technological development is now essential to the entire Russian society. It affects national economy and management, as well as the culture and formation of Russian society values system; to launch full scale modernization the society has first to select the priorities for innovation development and identify methods of its implementation.

Russia's integration into the global economy, growth of decentralization and regional differences - all these factors facilitate the region's interest in maximizing their degree of competitiveness and effective use of available resources. In this regard, an urgent task is to determine the priorities of long-term innovation development, ensuring economic growth and social stability.

Nowadays, economic restructuring based on innovative principles is a key issue on the agenda of almost all the Russian regions. It ensures significant increase in competitiveness of regional economies, constant growth of the proportion of high-tech sectors and industries, and accelerated growth of production of major innovative products. Elaboration of strategic objectives in this area is directly related to the development and implementation of regional innovation policy and selection of priorities for innovation development of the region, serving as the benchmark for major policy initiatives.

The regions facing economic and social problems often tend to consider their problems as external factors, totally out of their scope of control and associate them with rising prices for raw materials and energy sources, globalization processes, tough expansionist policies of the manufacturers from other countries, excluding out local producers and other similar factors. The most common solution to these problems consists in arranging financial assistance from external sources. At the same time, the possibility of increasing the use of available resources is rarely, if at all, taken into an account, and the prospects and restrictions in the intensification of accumulated potential development, diversification of economic activities or attrition of inefficient production processes are not considered.

The level of innovative activity is still low in most regions. At the same time, there was no noticeable dynamics in many regions over the last ten years. With an overall low

innovation activity (as determined by the share of organizations involved in technological innovations, in total number of organizations in the region) there is a sufficiently large variation in this indicator for separate regions (Appendix 1).

2 Innovation activities of organizations

The leading regions for innovation activity include the following: Magadan region (26,9%), Perm Kraj (26,4%), Orenburg region (17,0%), Tomsk region (16,0%), City of Moscow (14,9%), Republic of Tatarstan (14,3%), Samara region (13,8%), Nizhny Novgorod region (13,25), Republic of Bashkortostan (12,6%). At the same time in relation to economic activities, the basic share of innovation activity is attributed to the field of communication, activities related to the use of computer and information technologies and wholesale trade (Appendices 1–4).

The regions-outsiders may include Republic of Altay, the Republic of North Ossetia-Alania, Sakhalin oblast, in which innovation activity stands for only 2-3%%. Thus, the gap between the leading regions and regions-outsiders in the area of innovative activity is more than multiple of 10. Significant inter-regional gap is registered for such important indicators as domestic expenditure on research and development, both in absolute terms and in proportion to gross regional product.

Prospects for the development of a region to a large extent depend on its ability to concentrate its capital resources of the most important areas and to choose the most important projects through joining efforts of key stakeholders in economic growth and development of the region to achieve a common goal. It is necessary to reach consensus on development objectives and tools instrumental to achieving these objectives, as any other program can cause rejection and lead to unintended negative consequences.

A special class of methods, combined by term "Foresight" is used for solving such problems. Modern Foresight approaches generally mean the organization of a systematic assessment of long-term prospects for development of science, technologies, economy and society in order to identify strategic areas of research and technologies that can bring the greatest social and economic impact.

Foresight projects are efficient practical instrument, which facilitates improving the efficiency of decision-making at national and regional levels. These projects take into account many different factors and define the results of their joint activity.

The most important characteristics of such projects include: strategic direction (area), the combination of a large variety of methods for getting the complete characteristics of the situation, understanding of the necessity for joint efforts of all stakeholders for program implementation to achieve a real consensus about the directions (areas) of technological development and concrete steps to implement them.

3 Approaches to selection of priorities for innovation development of the regions

In recent years there has been intense activity in the implementation of Foresight projects at the regional level. Regional Foresight-projects are characterized by remarkable diversity and use of different methods [1, 2]. The methodology of these researches varies depending on the objectives of research, initiators and organizers of the project, local traditions and culture, the experience of Foresight implementation in the region and many other factors.

Many of the regional Foresight projects directly touch upon the topical issues of its innovative development, including those related to setting regional innovation priorities. Considerable interest in the problem of setting regional priorities for innovation development using the Foresight methods can be explained by a number of reasons.

Development and improvement of regional innovation policy at regional level are an essential element of a long-term strategy of socio-economic development of the region, which makes possible development of base for long-term sustainable economic growth and increasing population prosperity.

It should also be stated that the technological innovations play key role in predetermining competitiveness of a given region or country as a whole, contributing towards creating conditions for economic growth and increase of population well-being. Grasping the essential role of setting strategic priorities for sustainable long-term competitive advantages of the territory, has led to the development of a methodological base for similar works and the development of appropriate procedures.

The future of the region depends on many factors. Among these are inter-regional, national and global environment, as well as external factors affecting the development of the region, various internal factors of development (social, economic, political, etc.), strategies which are implemented in the region and others. In setting regional priorities for scientific-technological and innovation development it is necessary to take into account major external or global trends that may affect the development of the region. Since the regional authorities are unable to influence these trends, or to change them, they should try to foresee and find out the factors that they can influence at a local level. It is very important to take into account strategies already implemented in the

region. Of course, the key to the success of any project in this area lies in accounting for internal factors determining the situation in the region and its development. An extended potential of Foresight projects is one of the reasons for applying this methodology.

In selection of priorities for innovation development at the regional level, it is important to arrange maximum involvement of leading specialists of major developed areas in the region - so-called key players. Their integration into the process may ensure that complete and adequate of information on the situation in the region is provided, and also create preconditions for the subsequent effective actualization of identified priorities.

Identification of stakeholders and the most influential participants requires considerable pilot analysis and is conducted before the process of priorities selection for innovation development is launched. Methods of “key players” identification are determined by features of assigned task and characteristics of the region; as a rule, at this stage the main components of the regional innovation system are reviewed.

The selection of priorities for innovation development and possibility of its successful implementation is largely determined by the extent of stakeholders’ involvement in the process of identifying areas for future development, by mobilization of capacity of the most active economic agents acting at the regional level. The high degree of involvement of all stakeholders in this process through their substantial participation in the work increases the interaction between all potential partners in the subsequent implementation of identified priorities, highlighting new connections creates conditions for further effective cooperation between all stakeholders. Similar approach is especially important for Russia with its tradition of use of informal contacts to resolve various problems and confidence in the relations developed in the process of personal interactions.

Strong influence on the development of procedures for identification and implementation of regional priorities for innovation development entails the necessity to select a relatively small number of priorities introducing severe restrictions. New technologies are developing, actively influencing each other and constantly opening new possibilities for applications. Moreover, the resources for carrying out policies in science and technology area are often limited, and because of complexity and

increased costs of research and development, budget expenditures are becoming increasingly scarce and society demands higher level of control of budgetary funds expenditures. Such a situation forces the persons responsible for the development of scientific, technological and innovation policy, to seek ways to concentrate the resources on fewer of the most important directions that in this case would support strategic advantages of the region in the long-term period.

An important problem is the uneven character of development of innovation systems, both national and regional. As a rule, the main elements of innovation system are characterized by different levels of development, and the interaction between them isn't organized effectively enough, which prevents the full functioning of the system as a whole. This gives a qualitatively different weight to the problem of determining the order of updating the priorities of scientific and technological development and innovation - all stakeholders should be involved in discussion and joint decision-taking concerning future directions for the concentration of their efforts.

The complexity and diversity of science and technology development preclude determining its prospects for growth based on the vision elaborated in the frames of any single participant of the system - the growing inter-disciplinary nature of research, inter-penetration of approaches in the development of technological solutions require involvement of experts from many different areas to identify opportunities for evolution of separate areas of science and technologies, and this is more likely in case of determining regional priorities for scientific, technological and innovation development.

Possibility to determine the most effective areas of efforts concentration in research and development and to facilitate their practical implementation is one of the main results attained through performing the procedures for setting and updating regional priorities of scientific, technological and innovation development.

Moreover, organization of cohesive work of various parties interested in raising the level of innovative activity in the region, and also in modernization of its economic structure, can change the entire attitude to the sector of research and development, contribute to its prestige, especially through conduct of an appropriate PR campaign disclosing the urgency of ongoing work and promoting its results.

Executive authorities are primarily interested in the results of works on identification of innovation priorities, since they have been tasked to create the most attractive environment for economic and social development of the region. Therefore, they shall assist as much as possible in strengthening the competitive advantages of the region and contributing to its standing at the national and international levels.

In this regard, executive authorities of different levels are encouraging the development and actively using appropriate tools and mechanisms for identifying the priorities for research and development, as the Foresight in research and technologies, centralized or decentralized advisory boards, etc.

Regional companies and organizations are the principal beneficiaries of these projects. Production enterprises acquire information about feasible prospects of development for existing and emerging markets of goods and services, the horizons for the development of the major technological directions. This is especially important for small and medium-sized enterprises, which often need guidance in the fast-changing variety of new technological solutions.

On the basis of data collected in the course of project implementation business structures get the opportunity to put together long-term investment programs, based on objective assessments of the future.

The process of interaction and discussion of common problems in the project between experts from the real sector, business and science, will also encourage development of informal relationships, which could result in the development of innovative activity of industrial enterprises, implementation of scientific ideas in the form of new goods and services.

Participating in the project, a business can significantly affect the formation of regional innovation priorities system taking into account the needs of the real sector. The state scientific and technical policy would be orientated towards creating a modern regional national innovation system. Innovative production enterprises will act as a focus of such system, forming the "order" for applied research and development.

In setting priorities of innovation development it is also important to respect the interests of the region's population - if not directly, then in some indirect form. For

example, its representatives may participate in the survey, which aims to determine the long-term objectives; the identified priorities of innovation development will help in the decision-making or in selection of the most important innovation products.

Involvement of key persons in setting and implementing priorities for innovation development at the regional level will prove useless unless those key actors are confident in meaningfulness and the prospects of their own efforts. To ensure such an attitude, it is necessary to nurture the real interest of regional authorities at the highest managerial level in the implementation of developing project. Authorities should actively assist in the whole exercise, contributing to the legitimacy of the work results.

The most important results of the projects aimed at selection of priorities for regional innovation development include the following.

Implementation of systematic organized project on the selection of priorities for regional innovation development enables the region to get additional resources from the federal budget. It is easier to ensure the inflow of investments, since necessary information can be provided to the potential investor, highlighting the prospects of business investments in the appropriate development directions (areas) in the region. The region also gets an opportunity to have a claim on the appropriate federal or international program or its separate elements, etc. Such prospects are usually attractive to various participants of a regional innovation system and may be of interest for representatives of regional business community, different members of local community organizations and associations, representatives of academic community and organizations conducting the research and development.

Better competitiveness of regional innovation system and establishment of long-term competitive advantages are the other factors favouring investment. For example, in order to enhance commitment of the local authorities it is possible to appeal to the prospects of improving the performance of regional research and development sector, the possibility for modernization of economic activity in the region and prospects for long-term economic growth. For members of academic community and professionals involved in research and development, the argumentation may be focused on prospects of more intensive integration into the global science and technology because of the quality priorities system upgrading in science and technology and innovation development offered by the project. For business community persuasive arguments

can be related the prospects of new markets development - from intra-regional and markets of surrounding areas to the national and, possibly, international.

The importance of social networks organization for the implementation of selected priorities in science, technology and innovation development can also be used as an argument for committing experts to work on the project. Participation in the project, in this regard, is especially relevant for decision makers, as well as business associations, since it creates the potential for developing shared ideas, building mutual awareness of resources and capacity of all stakeholders. In addition, during active interactions all stakeholders grasp the specificity of the regional context in which they work, and familiarize themselves with the regional business environment.

In the future, it is also important to ensure joint efforts to implement the project results by all interested organizations and individuals. It is also possible to use both formal and informal procedures. Former procedures encompass preparation of reports, work plans, necessary lists (for example, list of critical technologies, list of experts, etc.). These procedures facilitate organization of transparent system of communication between all parties involved in the process, and also contribute to the development process of clear and understandable management plans for the project. The informal procedures may include the formation of close relationships ("social networking") between the scientific and technological community - a necessary condition and one of the main products of the complex work on defining and updating the priorities of scientific, technological and innovation development. The formation of stable interaction systems of main agents creates the prerequisites of regional innovation system integration, which is instrumental for updating the selected priorities for regional scientific-technological and innovation development.

The most effective way to commit experts to participation in the project is to nurture their belief in the prospects of its implementation, related to potential results of the project.

An additional factor which may create an interest in participation in the work process on priorities setting of innovation development at the regional level among all stakeholders is a wide information support for the project, which is also extremely useful for legitimacy of project results.

Dissemination of policies related to priorities setting in science, technology and innovation development has led to certain formalization of the methodology for such works – a wide array of principles and procedures for implementation of these projects has been developed. In particular, the procedures and requirements were defined enabling efficient selection and identification of regional priorities in science, technology and innovation development more efficiently.

4 Types of regions and selection of methodology for regional innovation priorities setting

As mentioned above, Foresight, which is in this case methodology adaptation of strategic foresight to regional level, is widely used in many countries. Foresight facilitates the choice of strategic alternatives of regional development based on existing possibilities.

Nowadays Regional Foresight methodology is being actively developed, based on the best practices [3]. Active use of Foresight methodology in various areas designed to encourage greater validity of solutions aimed at improving the competitiveness of regional economy, acceleration of economic growth through high technologies use, identification of practical solutions for major social and economic problems in the medium and long- term period.

Regional Foresight facilitates the development of effective strategy and tactics for regional development. It helps to develop an effective innovation policy, to optimize the infrastructure that will encourage transformation of traditional economy in the new economy of knowledge.

Appropriate strategy involves limited choice of innovation priorities that encourages innovative activity in the most prospective areas, enhancing economic diversification and its sustainable growth, and leads to new innovations.

Various methods which assist data collection and interaction of experts can establish methodological basis for the work on setting priorities of regional scientific-technological and innovation development. The methods can be the following: expert panels, organization of focus-groups, surveys of experts and many others [4].

The principal requirement is relevance to the assigned task, connection with available resources, as well as carrying out of preparatory work relating to the definition of spectrum of methods which can be used in future work at the early stages of the project implementation, that makes it possible to use efficiently time, financial and human resources available to project participants, provides an opportunity for conduction of qualitative analysis of the results and creates the necessary preconditions for the full updating of priorities selected during the work.

Requirement of adaptation to specific situation in the region is a key to successful project implementation, since it enables integration of methods and approaches used in solving similar problems, in the context of specific strategic areas, especially in respect of unique features of the region under review. It is important not merely to replicate basic approaches, but adapting the methodology of priorities selecting and updating for scientific-technological and innovative development to the needs and special conditions existing in the region.

Customized methodological solutions for Foresight-projects, focused on tasks development, related to growing innovative activity in the region, are offered. In this regard the experience gained through works conducted in the European Union is of an utmost interest.

The Foresight purposes and objectives, which vary depending on the specificities of the region, for which is the Foresight project is implemented, are the basis of classification developed in the European Union. This classification identifies five types: ARGIBLUE, FOR-RIS, TECHTRANS, TRANSVISION, UPGRADE [5-9]. Moreover, instructional materials for the regional Foresight implementation in the EU countries are based on this classification.

Problems of growing innovation activity are directly related to two types of regions in this classification: FOR-RIS and UPGRADE [6,9].

The first type includes the regions that have already developed a short-term innovation strategy and vision of long-term development prospects. In these regions, the regional Foresight either was implemented, or long-term vision was formed on the basis of national Foresight. Usually, short-term innovation strategy is implemented on a period not exceeding 5 years. Therefore Foresight, designed to develop strategic vision for the long-term prospect, is a logical development of such strategy. Research in this region is primarily focused on the connection between the regional innovation system and the long-term vision, which is the result of Foresight. In this formulation, the problems of planning, strategy operational efficiency and the highest practical output of Foresight are of particular importance.

The second type includes regions, that are in a need of innovation strategy change and ensuring innovative growth. In Europe the regions with developed heavy industry

usually require diversification of the economy. As a rule, the authorities in the region have already grasped the necessity of reforms or have already started the reform process. In this case, Foresight is used to identify regional competitive advantage and re-orientate of the economy. In this case, the emphasis is put on creating new regional innovation system in contrast to the previous case. In this context, questions of particular importance are development of new vision of the future, for which the new concept of management, planning system and effective mechanism for Foresight results implementation is developed.

In particular, the last type of research is in demand in many Russian regions. The main emphasis in UPGRADE projects is put on problems of economy reorientation and creation of new long-term strategy. Therefore, methods aimed at stimulating experts' creativity are of particular importance. Brainstorming, elaboration of scenarios, analysis of motivating factors, methods of prediction of wild cards and other similar methods are actively used among them. The scheme "what will, if" is used for the construction of alternative variants of future in the applied approaches. In this problem formulation, research methods, as a rule, have priority over the standards, as usually there is no clear vision of desired future common to all the participants.

UPGRADE projects methodologically involve implementation of three consequent steps. The priorities are identified at the first step. SWOT-analysis and STEEP-analysis are used as tools of analysis. They are usually carried out by experts, divided into small groups. All the factors identified in the analysis are sorted by priority. The following two approaches are used for these purposes. In the first approach, the experts should come to consensus on priority of selected directions (areas) on the meetings like seminars or conferences. The second approach involves voting. Directions (areas) which received the largest number of expert votes shall be declared as priority.

Alternative options of the future, based on selected priorities, are investigated at the second stage. Scenarios are usually used for this purpose. Various approaches are applied for experts' creativity stimulation.

The third stage encompasses development of strategy aimed at achieving the desired future. Roadmaps, as well as other similar methods of planning are used in solving this problem.

Established principles, coordinated with the best international practice, were implemented in the project on priorities selection of innovation development in the Republic of Bashkortostan.

5 Case-study of regional foresight for selection of innovation development priorities

Bashkortostan is one of the first Russian regions attempting to apply Foresight to identify the priorities for its innovative development. This typical Russian region with substantial, if unused, capacity for innovation, carried out necessary work to identify and use this capacity in the mid-term prospect.

Regional Foresight was aimed at determination of winning strategies and tactics for regional development. Its objective was to develop an effective innovation policy aimed at improving the technological level and activate innovations in traditional heavy industries. Correct strategy involves a limited choice of innovation priorities that encourage innovative activity in the most prospective areas, provide economic diversification and sustainable growth.

It is important to keep in view long-term horizon period in the priorities setting process, since it assists in stimulation of orientation at innovative component in industrial production, increasing the opportunities for cooperation between research and industrial organizations, encouraging the growth of research activity in the industrial sector.

It is necessary to reach strategy development consensus on key development directions among key stakeholders: administration, business, science and population of the region. In Bashkortostan, attempt to reach such consensus was made. Several interested parties supported Foresight Project. The executive authority has created favourable conditions not only for the successful implementation of the project, but for implementation of measures aimed at supporting the priority directions (areas). Republican Fund of innovations support was coordinator of the project. The Institute of Statistical Research and Knowledge Economy of HSE has developed regional foresight methodology.

The ideas of Upgrade approach (the transition to a new level of industrial development) were the main methodological approach for the selection of regional innovation priorities of Bashkortostan. Upgrade approach provides the system of activities aimed at modernization of the region economy in accordance with modern requirements and

creating a base for sustainable development and competitiveness of the regional economy.

Using this approach, the following objectives may be achieved:

- Increasing the technological level of production and quality of professional training for the staff in the region;
- Activation of innovation policy at regional level in accordance with the specificity of structural problems associated with traditionally prevailing economic system, lagging behind the pace of development of global economic processes;
- Identification of existing capacity for development and achieving the clear vision of development prospects, providing the use of available opportunities and competitive advantages.

In accordance with these objectives and general recommendations on the implementation of regional Foresight projects, project methodology was developed. The methodology involves the following steps:

- Development of approach;
- Analysis of economy and research and innovation area;
- Selection of innovation priorities;
- Discussion of identified priorities and preparation of plan for their implementation.

Below the description of the main steps of Foresight project, as implemented in the Republic of Bashkortostan, is provided.

6 Development of methodology

The developed methodology of priorities selection of innovation development has updated and specified the general approaches and principles of regional Foresight. The most important principles were the following:

- Coordination with federal priorities;
- Consideration of region-specific factors;
- Formation of a concerted vision of prospects among key participants of Foresight exercise.

Continuity of methodological solutions used in selection of priorities in scientific and technological development at the federal level was provided in methodology development process for selection of regional innovation priorities. In the selection process of regional innovation development priorities, main method was using of critical technologies combined with SWOT-analysis, experts interview and focus groups.

In this project, the regional innovation priorities were the scientific results with a wide field of practical applications, corresponding to the level of best international and national surveys, prospective technologies with the greatest innovation potential, new high-technology products and services with competitive advantages in developing and emerging markets, where scientific and technological potential of the Republic can be effectively used.

Emphasis was put on regional research and development, corresponding to best Russian and world standards. The list of priorities for development of science, technology and critical technologies approved by the President of the Russian Federation in 2006, was taken as a basis for innovation priorities of Bashkortostan [10].

The demand for innovations of regional enterprises and socio-economic goals and objectives, which were recognized as the most important in the republic, was taken into account.

Within the Foresight project frames there were the task not only to provide the forecast materials, but also form a coherent innovative development prospects vision of "key players", defining scientific and technology, innovation and socio-economic policy of

the region. Participation at all steps of the project the representatives of administration, large industrial enterprises, business, science and education facilitated solving of this problem.

Innovation priorities selection was preceded by analysis of economic, scientific and technological potential of the region.

The Republic of Bashkortostan - one of the largest regions of the Russian Federation in terms of population and economic potential.

The Republic can be classified as the oldest industrial Russian regions. Industry is a major contributor of the gross regional product; agriculture, construction industry, transport, communications and trade contribute about one-third. The region has well developed mining and manufacturing industries. In the industrial structure mechanical engineering and metalworking, chemical and petrochemical industry and electric-power industry are prominent. In machine-building complex of the republic there is a high share of aviation industry. Developed energy sector fully meets the demand of the region for electricity and heat, the local energy system is the largest regional energy system in Russia. Republic is well known as research centre, more than 4 thousand of qualified researchers, working on a wide range of issues in almost seventy scientific organizations.

In recent years, Bashkortostan has high rates of economic growth. The main factor for the growth of gross regional product was development of mining and manufacturing industries. Financial and credit sphere is dynamically developing in the republic. Bashkortostan is one of the few regions-donors of budgetary system of the Russian Federation.

However, the development of the region is put back by poor development of market institutions, high level and constant growth of intermediate consumption with lower share of added value of products. There is dependence of the republic's economy on the price situation on the world energy market, because share of export-oriented sector is high in the region structure. High level of capital funds depreciation of the leading economy sectors and low competitiveness of many enterprises have an impact on dynamics of region economic development.

Level of innovative activity in the Republic of Bashkortostan in the last few years varies between 8 and 12 per cent, the share of innovative products of enterprises is negligible, and in exports does not exceed 1 per cent. Domestic expenditure on research and development in the republic did not exceed 0.5% of GRP. All these figures are extremely low and demonstrate considerable hidden potential of regional producers. Development of innovation activity in the republic is put back by the absence of strategy and appropriate mechanisms for innovation processes management.

Insufficient funding of research and development, lack of modern scientific and technological equipment, and of experience in collaboration between scientific, technological and industrial organizations and investors, as well as poor development of innovative structure and inadequate legal framework have a negative influence.

However, Bashkortostan has a real chance to become the flagship of Russian economy. But in order to meet these objectives the region should undertake a sweeping technological modernization of large and medium-sized enterprises, aimed at raising the share of deeper processing of raw materials and production of products with high added value.

The most important condition for the production of innovative goods and services and decrease of raw materials share in export structure is development of innovative strategy for growth, including a limited choice of regional priorities. Their active support will encourage the development of the most prospective areas, providing economic diversification and sustainable innovative growth on new basis.

7 Selection of priorities

Selection of innovation priorities process was organized as a multi-stage examining operation (survey), with participation of more than 100 experts representing such venues as management, science, education, industry and business.

Expert groups, including managers and senior experts of executive authorities, representatives of research centers, educational institutions, including leading academic institutions of Bashkir State University, Ufa State Aviation Technical University, enterprises and organizations of the region, were formed for each of the priority areas.

For pre-selection of priority areas and key technologies about 30 experts were involved, and about 100 experts participated in the survey. Selection was organized in such a way that all the subject areas of priority were presented by several experts. From seven to twelve experts participated in the focus-groups in each priority area at the final stage.

During multi-stage examining operation (survey) the following tasks were solved:

- Formation of expert groups;
- Pre-selection of priority areas and critical technologies;
- Survey of experts;
- Carrying out of moderated discussions;
- Summary of results.

In formation of expert groups and selection of participants for survey the following approaches have been applied:

- Recommendation of the executive authority, the Academy of Sciences;
- Co-nomination - a process in which each expert among those selected at the previous iteration are asked to recommend specialists able to give an opinion on each item in questionnaire;
- Analysis of data provided by various scientific foundations, to select the most competent specialists;

- Quantitative analysis of scientific activity, reflecting the publishing activity and other indicators of scientific experts' activities.

As a result, the procedure for establishment of expert groups included a set of organizational, advisory and research activities, which enabled to carry out multiple-aspect selection of highly qualified specialists in various fields of science, technology and engineering in the republic.

After activities on selection of experts and organization of expert groups are completed, special survey is carried out to draft proposals for the formation of the list of priorities for innovation development.

At the next stage of the examining operation, preliminary list of priority areas and technologies, which has a critical status in the Republic of Bashkortostan, was formed. In order to take into account size and structure of the regional economy, the list of pre-selected regional innovation priorities of high level is organized in such a way as to include all the civil technological directions from the federal list in formulations considering specificity of the region. Due to the significant contribution of industry to the gross regional product, production systems were identified as a separate direction (area).

32 technologies from the national list and five technologies of direction "Production Systems" were included in the initial list. Each of them was presented as a set of technologies of the next level, whose number varied from 3 to 7. 206 low-level technologies were selected in the course of the project, and then expert analysis was applied to them.

The selection of regional priorities for innovation development was carried out using the method of critical technologies. The set of criteria was defined and used to evaluate the importance of a specific technology. The scales that facilitate evaluation of the initial list of technologies were designed for this purpose. Experts evaluated each technology from the initial list of selected set of criteria. The technologies, that received the highest score, were recognized as "critical technologies". At the first stage all technologies were evaluated by two criteria: the level of research development and activities in this direction (area) in the republic and their importance for the development of its economy.

Technologies, which were not virtually used in research and whose contribution to the development of regional economy was insignificant, were omitted at the preliminary step of survey. Detailed analysis was carried out on the remaining list of technologies on the basis of information collected with specially designed questionnaire that included questions about the level of scientific and technological research and development, their practical application, the importance of competitive growth for enterprises, the conditions for production of innovative products, etc. Experts from science, management and business were interviewed through presenting this questionnaire. The experts could make clarifications in the formulations of evaluated technologies and their components, add new ones and give reasons for exclusion of obsolete technologies for the region.

Lists of the most important innovation products and services, which can be produced in the next 10 years with using national R&D results, were set up as a result of survey.

The results of the survey became the basis for moderated discussions, which took place in the final selection of critical technologies and components.

Generally, the selection procedure was adequate to the approach, which was used in formation of national critical technologies lists. [10]. Experts improved the list of major innovative products, which could be produced by regional enterprises or with their contribution. Agreed list of innovative products was used for selection of specific technologies of low level. Only those technologies which meet all the formulated criteria and can be used to create the most important innovative products were considered. The final list of critical technologies was created taking into account selected technologies of the low level. The critical technologies, in turn, were used to improve the formulations of priority directions (areas).

Discussion in focus-groups significantly reduced the number of regional priorities and made it possible to propose measures, which can facilitate their implementation. The results of all focus groups were summarized and presented in the form of lists of priority directions, critical technologies, specific technologies included in them, and the most important innovative products.

Each critical technology was presented with brief description (passport of critical technology), including its basic purpose, fields of application, innovative potential, a list

of scientific organizations with the greatest theoretical potential in this area. Its main purpose is to provide awareness of decision- makers, potential investors about particular technology and what economic, technological and social effects can be expected from this technology.

8 Obtained results and implementation of innovation development priorities

Seven directions (areas) for scientific and technological development, 28 critical technologies, 75 technologies included in them, and about 200 major innovation products were chosen as a major innovation priorities for the Republic of Bashkortostan.

The list includes seven priority areas of science, technology and engineering development:

- Transport and aviation;
- Living systems;
- Nanosystems and materials;
- Information and telecommunication;
- Manufacturing;
- Rational use of nature;
- Energy and energy saving.

The research revealed that Bashkortostan has considerable scientific, technological and innovative potential in all selected priority areas, which can be implemented in the medium and long-term perspectives. The most prospective complexes of inter-industry (multi-disciplinary) technology solutions that create preconditions for further development of existing and new technological directions (areas), which have a wide range of potential innovative applications in different sectors of regional economy and social sphere, were identified as critical technologies. The list of critical technologies of the republican level is presented in Table 1.

Table 1. The list of critical technologies of the republican level

Transport and aviation
Managing new generation transport systems
Aviation Engineering
Energy-efficient engines for transportation systems
Living systems
Bioengineering and cell technologies
Enzymatic, bioartificial, biosynthetic and biosensor technologies
Biomedical and veterinarian technologies of life support and protection of human beings and animals
Medicines
Diagnostics, medical treatment, and preventive treatment of the diseases
Nanosystems and materials
Volume nanostructure materials
Surface nanostructure materials
Composite polymers and elastomers
Composite and ceramic materials
Membranes and catalytical systems
Manufacturing
Mechatronics modules based equipment
Forming, thermal processing, control and assembly
Laser and plasma technologies
Rational use of nature
Monitoring and forecasting the state of atmosphere and hydrosphere
Resource assessment and forecasting the state of lithosphere and biosphere
Processing and utilization of technogenic wastes
Decreasing risks and damages of natural and technogenic catastrophes
Environmentally safe exploration of layers and extraction of minerals
Information and telecommunication
Intellectual management systems
Processing, storing, transmission and protection of information
Distributed computing and systems
Production of software
Energy
New and renewable sources of energy
Energy production from organic raw materials
Energy saving systems for transportation, distribution and consumption of heat and energy

There are developments, corresponding to best Russian and world standards, in all priority areas of science, technology and engineering in the republic. Researches in these areas are essential for improving the competitiveness of regional producers and economic growth acceleration in the republic.

In general, researches in the field of nanotechnology and nanomaterials correspond to the best Russian standards, and the development of nanostructure metals, constructional nanomaterials and alloys with special characteristics - to the world standards. They are regarded as the most important sources for long-term innovative growth of the region.

Many researches and developments in the field of aviation and transport systems on the theoretical concepts correspond to the best Russian practice and have direct impact on the acceleration of economic growth in the region. Within the frames of priority area "Manufacturing", precise technologies of forming, control, assembly, laser and plasma technologies are the most prospective. Area “Energy” is the most important for development of the Republic of Bashkortostan, although the level of research and development is inferior to the best Russian models.

Information and telecommunication technologies have a major impact on innovation activity in the region, but their development also hinders the low level of scientific developments.

The region has a good scientific and production base for development of bioengineering and cell technologies. Researches in this area are highly relevant in terms of solving social problems and improvement of quality of health care services. Some works of Bashkir scientists in the field of genomics, proteomics and pharmacogenomics meet world standards.

Level of studies in environmental management, particularly in areas such as water production technologies, water supply and disposal, treatment of wastewater and drainage water from industrial production, introduction of non-destructive control methods were generally adequate to best Russian developments.

If the critical technologies cover a wide range of technical solutions, the technologies of next level are focused on more narrow areas that can be illustrated by the example of priority area “Transport and aviation”.

The most prospective technologies are those related to unconventional design schemes for aviation aircrafts, new generations of aircraft engineering with use of composites and nanomaterials, development of hybrid power units, engines using compressed natural gas, rapid prototyping, based on CAD / CAM / CAE, etc.

Critical technologies and technical solutions concerned with innovative products, which are made with use of these technologies and solutions, build an information base for the development of specific investment projects.

The number of major innovative products varies from 20 to 30 for each priority area. For example, the following innovative products were selected as a major for the direction “Transport and aviation”: helicopters for various purposes, trolley buses with diesel generators, gas turbine and turbo-prop engines of new generation of aircraft, engines for automobiles, watercraft, snowmobiles, gas-turbine drives for gas pumping units on the base of aircraft engines, cooled perforated turbine blades with multi-component thermal barrier, the propelling nozzles with thrust vectoring control. Many of critical technologies relating to energy, aviation and transport systems, industries of nano and living systems, already have significant potential markets. Detailed description of results is presented in [11].

Regional innovation priorities, formulated on the basis of Foresight methodology, make it possible to understand and specify the most important strategic competences of enterprises and organizations in the region.

The main directions of innovative development of the Republic of Bashkortostan, identified in the study, established the basis for the formation of specific activities to develop its economic and social potentials, formation a regional innovation strategy, which involves increase of technological level of production and growth of innovative activity of republican enterprises and organizations.

Development of principles of budgetary aid and establishment of system for monitoring of all activities for the implementation of innovation policy in the Republic of

Bashkortostan are supposed to be introduced in order to effective implementation of the most important innovation priorities.

The support of priority areas will enhance the competitiveness of regional manufacturers, release of new products, increasing the share of manufacturing industries, introduction of new technologies, cost reduction and improving of products quality and development of labor productivity.

The proposed methodological solutions are universal and can be widely used in other regions for selection of innovation priorities.

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Appendices

Appendix 1. Share of organizations involved in technological innovations in an overall number of organizations, data for entire Russia and regions

	2000	2005	2006	2007	2008
Russian Federation	**8,8**	**9,7**	**9,9**	**10,0**	**9,4**
Central Federal Disctrict	**10,0**	**10,3**	**10,4**	**10,0**	**9,4**
Belgorod region	7,9	8,7	12,0	16,0	10,8
Bryansk region	6,0	6,2	8,0	9,6	7,3
Vladimir region	8,3	10,7	16,4	10,8	8,2
Voronezh region	20,1	12,2	14,2	11,8	11,6
Ivanovo region	5,4	4,5	4,1	3,5	5,2
Kaluga region	12,7	14,0	13,3	12,0	8,9
Kostroma region	3,6	9,2	7,6	9,6	11,5
Kursk region	4,3	6,7	9,2	11,0	8,5
Lipetsk region	9,3	11,6	10,2	10,3	10,8
Moscow region	10,9	10,0	8,7	9,1	7,6
Oryol region	12,1	19,6	14,2	12,0	11,9
Ryazan region	4,7	7,0	7,7	4,7	8,8
Smolensk region	6,4	5,0	8,3	8,1	6,0
Tambov region	8,8	5,5	11,0	11,0	9,2
Tver region	7,8	4,7	5,2	5,6	6,3
Tula region	9,6	15,6	13,6	12,1	13,4
Yaroslavl region	6,3	8,5	6,3	9,2	8,0
City of Moscow	17,6	17,6	14,9	12,6	14,9
North Western Federal District	**7,7**	**9,4**	**11,0**	**9,8**	**8,9**
Karelia Republic	1,7	5,6	6,1	5,8	6,1
Komi republic	5,5	7,1	8,1	8,1	9,7
Archangel region	6,3	8,4	8,6	9,9	8,0
Vologda region	11,0	8,4	8,9	8,3	9,8
Kaliningrad region	13,1	4,6	14,1	10,1	5,1
Leningrad region	4,1	6,9	8,8	6,7	5,6
Murmansk region	7,9	13,5	12,3	8,0	7,9
Novgorod region	9,2	9,9	10,2	8,9	10,3
Pskov region	10,3	9,5	10,6	9,8	6,2
City of St.-Petersburg	8,9	12,7	14,1	13,1	12,5
Southern Federal region	**7,6**	**8,5**	**8,2**	**8,3**	**7,2**
Adygeya Republic	3,1	5,6	11,5	8,8	10,4
Dagestan Republic	6,4	9,2	10,9	10,7	8,3
Kabardino-Balkariya republic	3,5	6,8	7,4	3,2	4,1
Karachaevvo-Cherkessiya Republic	10,5	10,8	7,3	8,6	5,3
Republic North Osetiya-Alaniya	3,2	2,1	2,5	4,4	3,3
Krasnodar Kray	5,9	4,1	7,5	7,9	6,8
Stavropol Kray	7,6	10,5	8,1	6,9	7,2
Astrakhan region	2,7	9,0	3,7	7,1	6,9
Volgograd region	15,9	14,3	10,8	11,3	9,5

Rostov region	10,4	11,2	10,7	11,4	9,4
Privolzhsky Federal District	**10,1**	**10,8**	**11,4**	**12,8**	**12,5**
Bashkortostan Republic	6,7	8,0	7,9	11,7	12,6
Mary-El Republic	3,7	4,0	5,3	5,6	7,5
Mordoviya Republic	4,7	6,2	8,8	9,6	8,8
Tatarstan Republic	13,4	12,7	12,8	14,1	14,3
Udmurt Pepublic	8,1	8,3	12,4	12,9	11,4
Chuvash Republic	9,6	13,6	8,8	17,6	13,4
Perm region	28,2	33,2	26,1	23,2	26,4
Kirov region	3,6	3,5	5,8	8,0	9,2
Nizhegorodskaya region	15,5	14,7	14,8	13,5	13,2
Orenburg region	6,6	6,9	13,3	14,9	17,0
Penza region	5,1	8,4	8,2	8,6	9,3
Samara region	24,9	15,1	17,3	17,8	13,8
Saratov region	9,0	9,4	8,7	8,5	7,7
Ul'yanovsk region	8,2	6,3	7,9	8,2	8,7
Ural Federal District	**10,6**	**12,4**	**11,2**	**11,5**	**10,1**
Kurgan region	9,2	10,4	11,0	13,6	11,1
Sverdlovsk region	11,3	18,3	14,6	14,3	13,3
Tyumen region	8,4	5,8	6,7	6,6	6,5
Chelyabinsk region	12,7	13,9	13,0	14,1	10,9
Siberian Federal District	**6,1**	**7,7**	**8,1**	**8,1**	**7,7**
Altay republic	3,9	16,0	5,5	1,5	2,4
Buryatiya Republic	4,0	6,7	7,5	7,2	7,5
Tyva Republic	-	-	1,8	-	-
Khakassiya Republic	-	11,7	12,2	9,6	7,5
Altaysky Kray	12,3	10,1	9,1	8,9	7,2
Zabaikalsky Kray	6,0	5,9	8,5	6,0	5,5
Krasnoyarsk Kray	3,7	6,7	8,0	12,3	14,0
Irkutsk region	3,4	10,2	9,2	11,2	9,0
Kemerovo region	8,6	6,3	7,3	6,7	6,0
Novosibirsk region	5,4	5,9	5,3	4,9	5,4
Omsk region	4,6	5,3	7,8	6,3	5,8
Tomsk region	10,3	17,1	18,4	16,9	16,0
Far Eastern Federal District	**6,3**	**6,2**	**6,0**	**5,8**	**7,2**
Republic Sakha	6,6	5,1	7,0	5,7	4,7
Kamchatsky Kray	4,9	7,1	5,5	5,4	8,3
Primorsky Kray	5,8	4,4	2,4	3,5	6,0
Khabarovsk Kray	21,5	17,0	11,4	10,1	11,0
Amursk oblast	3,0	1,3	7,5	7,5	6,5
Magadan oblast	1,3	6,2	9,5	11,4	26,9
Sakhalin oblast	7,2	6,2	5,8	4,4	3,2
Evreisky Autonomous region	2,8	3,9	4,8	4,8	4,6

Source : Rosstat. Регионы России. Социально-экономические показатели - 2009г.

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Appendix 2. Organizations involved in technological innovations

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Number of organizations		Share in an overall number of organizations		Number of organizations		Share in an overall number of organizations	
	2006	2007	2006	2007	2006	2007	2006	2007
Russian Federation	**2490**	**2485**	**9.4**	**9.4**	**340**	**343**	**5.2**	**4.9**
Central Federal District	**749**	**719**	**10.0**	**9.7**	**106**	**99**	**5.7**	**5.0**
Belgorod region	38	47	11.1	15.4	2	6	4.9	8.6
Bryansk region	26	31	7.7	9.4	1	2	1.1	2.1
Vladimir region	54	43	13.3	10.4	8	5	10.7	6.7
Voronezh region	50	49	12.4	10.8	9	9	7.0	5.4
Ivanovo region	14	12	3.6	3.2	2	2	3.6	3.6
Kaluga region	33	32	12.0	11.3	5	4	12.5	10.0
Kostroma region	20	19	8.3	7.5	1	4	2.0	8.2
Kursk region	20	19	9.1	9.0	3	5	5.9	9.4
Lipetsk region	23	22	10.2	10.1	2	2	5.1	3.1
Moscow region	150	144	9.3	9.6	14	10	3.4	2.5
Oryol region	32	33	15.5	13.2	2	–	4.3	–
Ryazan region	15	11	6.3	4.7	2	1	5.9	2.3
Smolensk region	20	22	6.8	7.3	3	3	5.3	4.3
Tambov region	28	25	9.8	8.7	3	3	4.5	5.2
Tver region	24	26	5.0	5.4	1	1	1.8	1.3
Tula region	56	49	14.0	12.5	5	6	6.3	6.2
Yaroslavl region	25	32	7.2	9.2	1	2	0.8	1.7
City of Moscow	121	103	14.7	12.8	42	34	10.3	9.1

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Number of organizations		Share in an overall number of organizations		Number of organizations		Share in an overall number of organizations	
	2006	2007	2006	2007	2006	2007	2006	2007
North Western Federal District	**284**	**245**	**10.0**	**8.8**	**50**	**51**	**6.2**	**5.8**
Karelia Republic	12	9	6.4	5.5	1	2	4.0	8.3
Komi republic	14	12	7.2	6.2	4	3	7.5	7.0
Archangel region	12	12	4.6	5.1	4	6	6.2	8.0
Nenets Autonomous District	1	1	4.2	4.2	–	1	–	16.7
Vologda region	23	22	7.4	7.3	5	5	8.2	6.8
Kaliningrad region	23	13	11.0	6.7	3	2	6.4	3.8
Leningrad region	30	22	8.5	5.9	4	4	5.8	5.3
Murmansk region	17	13	8.9	7.2	7	3	10.1	4.3
Novgorod region	17	17	8.9	8.9	3	3	9.1	7.0
Pskov region	20	22	8.9	9.6	2	–	5.1	–
City of St.-Petersburg	116	103	16.0	14.5	17	23	4.9	6.1
Southern Federal region	**220**	**220**	**7.6**	**7.5**	**26**	**31**	**4.0**	**4.0**
Adygeya Republic	4	2	6.8	3.6	1	2	50.0	100
Dagestan Republic	11	10	9.8	9.2	1	–	14.3	–
Ingushetia Republic	–	–	–	–	–	–	–	–
Kabardino-Balkariya republic	6	3	4.6	2.5	1	–	20.0	–
Kalmykia republic	–	–	–	–	–	–	–	–
Karachaevvo-Cherkessiya Republic	4	4	6.1	6.8	2	2	12.5	18.2

(cont.)

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Number of organizations		Share in an overall number of organizations		Number of organizations		Share in an overall number of organizations	
	2006	2007	2006	2007	2006	2007	2006	2007
Republic North Osetiya-Alaniya	4	5	2.4	3.3	–	–	–	–
Krasnodar Kray	49	52	6.9	7.7	2	4	1.2	2.0
Stavropol Kray	33	25	8.4	5.9	3	3	4.7	4.2
Astrakhan region	5	11	2.7	5.6	2	2	3.4	3.4
Volgograd region	45	50	10.4	11.1	6	10	5.8	7.0
Rostov region	59	58	10.8	10.3	8	8	4.5	4.1
Privolzhsky Federal District	**640**	**700**	**11.0**	**12.2**	**57**	**67**	**4.6**	**5.1**
Bashkortostan Republic	60	79	8.1	11.9	4	5	3.3	4.4
Mary-El Republic	6	6	3.2	3.1	2	2	5.1	5.7
Mordoviya Republic	24	22	10.5	9.8	2	2	2.2	5.7
Tatarstan Republic	95	88	13.6	13.9	4	2	2.3	1.0
Udmurt Pepublic	48	48	12.5	13.3	3	4	4.8	4.2
Chuvash Republic	35	44	10.2	16.1	1	5	1.1	6.8
Perm region	75	78	29.1	24.1	9	12	11.4	13.3
Kirov region	20	27	4.9	7.8	2	2	2.2	2.2
Nizhegorodskaya region	98	105	14.0	13.5	10	10	6.6	5.7
Orenburg region	33	35	12.0	12.6	4	4	8.2	8.9
Penza region	20	22	6.8	7.7	3	3	12.0	7.3
Samara region	61	74	13.7	14.9	3	7	5.3	8.3
Saratov region	42	43	8.8	9.1	4	6	3.3	3.8
Ul'yanovsk region	23	29	5.9	7.3	6	3	7.8	4.2

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Number of organizations		Share in an overall number of organizations		Number of organizations		Share in an overall number of organizations	
	2006	2007	2006	2007	2006	2007	2006	2007
Ural Federal District	**247**	**265**	**10.7**	**11.2**	**36**	**35**	**6.3**	**5.5**
Kurgan region	23	29	9.7	12.5	2	2	5.6	6.1
Sverdlovsk region	101	102	13.2	13.2	17	14	8.4	6.1
Tyumen region	47	53	6.3	6.8	13	11	5.6	4.0
Khanty-Mansijsk Autonomous District – Yugra	27	27	8.2	7.6	7	5	10.1	6.8
Yamalo-Nenets Autonomous District	6	6	4.7	4.3	2	3	8.0	10.0
Chelyabinsk region	76	81	13.4	14.1	4	8	3.9	8.2
Siberian Federal District	**276**	**275**	**7.6**	**7.5**	**44**	**43**	**4.3**	**4.0**
Altay republic	1	–	2.2	–	2	1	20.0	5.0
Buryatiya Republic	10	9	6.2	4.9	5	2	9.4	4.0
Tyva Republic	1	–	2.1	–	–	–	–	–
Khakassiya Republic	8	7	10.3	9.6	3	1	25.0	10.0
Altaysky Kray	50	52	8.9	8.6	5	4	3.9	2.6
Krasnoyarsk Kray	34	49	7.1	12.0	3	4	2.6	3.1
Irkutsk region	26	28	8.2	8.2	5	7	6.6	13.2
Ust-Ordyn Buryat Autonomous District	–	1	–	9.1	–	–	–	–
Kemerovo region	39	34	6.9	6.0	2	4	2.5	4.7
Novosibirsk region	33	33	5.1	4.8	5	5	1.8	1.7
Omsk region	29	24	8.9	6.9	2	4	1.1	2.3
Tomsk region	32	32	15.6	16.1	7	5	15.6	10.2
Chita region	13	7	6.4	3.7	5	6	16.7	13.3
Aginsk Buryat Autonomous District	3	–	11.1	–	–	–	–	–

(cont.)

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Number of organizations		Share in an overall number of organizations		Number of organizations		Share in an overall number of organizations	
	2006	2007	2006	2007	2006	2007	2006	2007
Far Eastern Federal District	**74**	**61**	**5.0**	**4.3**	**21**	**17**	**5.1**	**4.1**
Republic Sakha (Yakutia)	20	12	6.4	3.8	3	2	6.4	3.6
Primorsky Kray	11	12	2.7	3.1	3	1	1.7	0.6
Khabarovsk Kray	23	15	10.4	8.2	4	5	8.2	11.4
Amursk oblast	7	9	4.0	4.9	3	–	8.3	–
Kamchatsky Kray	4	5	3.9	5.5	3	1	12.0	4.8
Koryak Autonomous District	–	–	–	–	–	–	–	–
Magadan oblast	2	1	3.4	1.9	3	4	18.8	23.5
Sakhalin oblast	6	5	3.6	3.0	2	3	5.4	8.1
Evreisky Autonomous region	1	2	–	5.4	–	1	–	3.8
Chukotka Autonomous District	–	–	–	–	–	–	–	–

Source: Индикаторы инновационной деятельности: 2009. Статистический сборник. М.- ГУ-ВШЭ, 2009.

Appendix 3. Costs of technological innovations

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Rubles (mln.)		Share in total volume of shipped goods; executed works, services		Rubles (mln.)		Share in total volume of shipped goods; executed works, services	
	2006	2007	2006	2007	2006	2007	2006	2007
Russian Federation	**188492.2**	**207499.2**	**1.4**	**1.2**	**22900.4**	**26558.5**	**0.7**	**0.6**
Central Federal District	**39935.8**	**39671.8**	**1.6**	**1.0**	**8815.3**	**6452.1**	**0.6**	**0.4**
Belgorod region	734.2	747.3	0.4	0.3	0.5	51.8	0.002	0.3
Bryansk region	591.7	829.2	1.1	1.2	0.6	2.1	0.01	0.01
Vladimir region	1272.5	1828.6	1.5	1.5	61.3	28.5	0.6	0.6
Voronezh region	1361.0	1658.6	1.5	1.5	736.9	796.0	3.7	2.7
Ivanovo region	108.5	931.4	0.3	2.0	26.2	72.6	0.3	0.6
Kaluga region	725.6	1141.7	1.1	1.5	42.9	87.9	0.8	1.0
Kostroma region	419.6	165.0	1.1	0.3	4.3	68.4	0.1	1.0
Kursk region	1347.4	491.7	1.5	0.5	157.7	148.7	3.3	2.4
Lipetsk region	996.1	1542.5	0.5	0.6	96.4	176.7	0.7	0.9
Moscow region	7115.5	12803.9	1.3	1.8	339.5	913.2	0.1	0.1
Oryol region	391.2	1160.4	1.2	2.4	1723.2	–	39.4	–
Ryazan region	1086.3	1029.1	1.7	1.2	6.9	19.3	0.1	0.1
Smolensk region	387.5	546.6	0.5	0.6	64.4	129.2	1.2	1.2
Tambov region	506.9	601.6	1.3	1.6	18.3	139.6	0.1	0.7
Tver region	775.6	836.3	0.9	0.8	0.1	2.4	0.0005	0.01
Tula region	3808.8	848.6	2.7	0.5	73.3	73.7	0.2	0.2
Yaroslavl region	2369.5	4444.3	2.2	2.9	174.9	60.0	0.4	0.7
City of Moscow	15937.9	8065.0	2.6	0.5	5287.9	3682.0	0.8	0.5

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Rubles (mln.)		Share in total volume of shipped goods; executed works, services		Rubles (mln.)		Share in total volume of shipped goods; executed works, services	
	2006	2007	2006	2007	2006	2007	2006	2007
North Western Federal District	**17570.7**	**19450.5**	**1.2**	**1.1**	**5255.1**	**9289.8**	**1.4**	**1.8**
Karelia Republic	506.4	794.7	0.8	1.2	103.5	418.3	6.5	19.3
Komi republic	357.7	654.0	0.2	0.4	143.6	270.6	1.0	2.5
Archangel region	233.7	514.7	0.3	0.4	60.3	399.5	0.5	2.6
Nenets Autonomous District	0.05	0.1	0.0002	0.0004	-	1.3	-	0.4
Vologda region	1450.1	3230.0	0.6	1.0	39.9	980.8	0.2	3.9
Kaliningrad region	2298.0	306.8	3.1	0.3	119.6	108.6	1.2	1.7
Leningrad region	2036.6	3890.2	0.9	1.4	22.6	0.6	0.2	0.002
Murmansk region	1803.1	3256.0	1.9	2.7	54.0	3.3	0.6	0.03
Novgorod region	2418.0	1055.1	4.0	1.1	63.7	423.1	1.9	12.0
Pskov region	147.4	191.8	0.5	0.5	0.3	–	0.004	–
City of St.-Petersburg	6319.7	5557.1	1.5	1.1	4647.6	6685.0	1.7	1.7
Southern Federal region	**10866.1**	**13698.2**	**1.3**	**1.3**	**512.1**	**933.5**	**0.3**	**0.2**
Adygeya Republic	80.2	36.5	2.1	0.8	9.3	22.1	3.4	5.8
Dagestan Republic	50.9	83.6	0.7	0.6	16.5	–	0.4	–
Ingushetia Republic	-	–	-	–	-	–	-	–
Kabardino-Balkariya republic	24.2	120.4	0.2	0.9	15.1	–	1.1	–
Kalmykia republic	-	–	-	–	-	–	-	–
Karachaevvo-Cherkessiya Republic	6.9	270.5	0.1	2.2	6.6	54.9	0.7	5.1
Republic North Osetiya-Alaniya	18.5	29.0	0.1	0.1	-	–	-	–
Krasnodar Kray	1488.1	1230.1	0.8	0.5	7.0	9.4	0.03	0.01

(cont.)

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Rubles (mln.)		Share in total volume of shipped goods; executed works, services		Rubles (mln.)		Share in total volume of shipped goods; executed works, services	
	2006	2007	2006	2007	2006	2007	2006	2007
Stavropol Kray	2502.1	1273.3	2.6	1.1	119.8	136.2	0.5	0.4
Astrakhan region	7.3	372.3	0.02	0.7	18.3	25.5	0.2	0.3
Volgograd region	5548.0	6557.5	2.1	2.0	86.2	199.1	0.2	0.4
Rostov region	1139.8	3725.0	0.6	1.4	233.2	486.4	0.3	0.4
Privolzhsky Federal District	**62970.9**	**67508.8**	**2.1**	**1.8**	**3055.3**	**3644.2**	**1.0**	**0.7**
Bashkortostan Republic	5762.0	5719.1	1.4	1.2	94.7	198.2	0.5	1.0
Mary-El Republic	51.9	50.8	0.2	0.1	3.8	29.6	0.1	0.9
Mordoviya Republic	3135.6	2579.4	6.2	4.5	207.4	126.7	4.9	4.4
Tatarstan Republic	17452.2	18854.8	2.8	2.7	116.3	38.3	0.3	0.1
Udmurt Pepublic	1316.5	2753.0	0.9	1.4	24.4	23.4	0.1	0.1
Chuvash Republic	1237.6	2357.9	1.7	3.2	52.8	160.5	0.4	3.2
Perm region	6470.3	7935.4	2.4	2.1	1591.1	1685.7	2.9	2.1
Kirov region	761.2	911.9	1.0	1.1	1.4	2.9	0.01	0.03
Nizhegorodskaya region	5600.4	8063.8	1.6	1.7	259.7	294.0	0.6	0.1
Orenburg region	694.8	2339.4	0.2	0.7	41.4	159.4	0.3	0.7
Penza region	1441.1	764.8	3.5	1.5	14.7	152.6	0.2	2.7
Samara region	16740.0	11438.9	3.4	2.1	508.4	346.2	2.4	0.6
Saratov region	1699.4	2868.1	1.5	1.6	42.7	384.8	0.2	1.3
Ul'yanovsk region	608.0	871.6	0.8	0.9	96.5	42.0	0.8	0.3

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Rubles (mln.)		Share in total volume of shipped goods; executed works, services		Rubles (mln.)		Share in total volume of shipped goods; executed works, services	
	2006	2007	2006	2007	2006	2007	2006	2007
Ural Federal District	**42247.7**	**46329.8**	**1.3**	**1.3**	**2917.0**	**3487.9**	**0.4**	**0.5**
Kurgan region	362.6	914.2	1.0	2.3	139.2	359.7	1.5	8.7
Sverdlovsk region	9375.7	11346.6	1.5	1.6	1903.5	2586.8	0.7	0.9
Tyumen region	18595.6	19254.3	0.9	0.9	150.5	144.9	0.04	0.03
Khanty-Mansijsk Autonomous District – Yugra	17321.7	18033.0	1.1	1.1	92.9	113.4	0.4	0.2
Yamalo-Nenets Autonomous District	1110.9	757.4	0.3	0.2	31.4	757.8	0.1	3.4
Chelyabinsk region	13913.9	14814.6	2.6	2.2	723.7	396.5	2.3	0.8
Siberian Federal District	**11745.8**	**17704.5**	**0.7**	**0.9**	**1748.0**	**2165.6**	**0.6**	**0.6**
Altay republic	155.3	–	9.6	–	17.6	4.4	8.6	0.3
Buryatiya Republic	402.1	208.8	1.3	0.6	190.9	154.9	4.1	2.5
Tyva Republic	0.001	–	0.0001	–	-	–	-	–
Khakassiya Republic	46.1	63.5	0.1	0.1	33.0	59.0	2.1	6.0
Altaysky Kray	997.4	1325.1	1.2	1.2	223.5	97.1	1.1	0.3
Krasnoyarsk Kray	1599.4	4951.2	0.3	0.8	157.4	693.5	0.3	1.0
Irkutsk region	3315.1	3020.7	1.6	1.2	481.1	616.3	1.2	1.7
Ust-Ordyn Buryat Autonomous District	-	0.02	-	0.01	-	–	-	–
Kemerovo region	1800.0	2520.0	0.5	0.5	45.0	63.1	0.2	0.2
Novosibirsk region	768.5	2320.8	0.6	1.5	278.0	216.2	0.2	0.2
Omsk region	725.8	1003.2	0.9	0.9	149.2	76.6	0.9	0.2
Tomsk region	1689.2	2209.1	1.1	1.3	126.4	162.8	1.0	1.1
Chita region	247.1	82.1	1.0	0.3	45.8	21.6	0.9	0.2
Aginsk Buryat Autonomous District	10.4	–	2.1	–	-	–	-	–

(cont.)

	Mining, manufacturing industries, and distribution of electrical energy, gas and water				Communications, activities connected with the use of computers and information technology, wholesale			
	Rubles (mln.)		Share in total volume of shipped goods; executed works, services		Rubles (mln.)		Share in total volume of shipped goods; executed works, services	
	2006	2007	2006	2007	2006	2007	2006	2007
Far Eastern Federal District	**3155.1**	**3135.7**	**0.9**	**0.7**	**597.7**	**585.3**	**0.8**	**0.7**
Republic Sakha (Yakutia)	1742.4	1766.7	1.2	1.2	341.4	459.4	4.3	3.9
Primorsky Kray	186.0	127.2	0.3	0.2	22.0	35.3	0.1	0.1
Khabarovsk Kray	1022.9	1101.1	1.4	1.4	63.0	51.9	0.3	0.2
Amursk oblast	74.1	79.3	0.3	0.3	149.4	–	2.2	–
Kamchatsky Kray	5.9	4.2	0.03	0.02	7.8	0.6	0.1	0.01
Koryak Autonomous District	-	–	-	–	-	–	-	–
Magadan oblast	6.8	1.5	0.04	0.01	3.7	30.9	0.1	2.1
Sakhalin oblast	96.0	20.7	0.3	0.02	10.4	4.5	0.3	0.1
Evreisky Autonomous region	20.9	34.9	1.1	1.1	-	2.7	-	0.3
Chukotka Autonomous District	-	–	-	–	-	–	-	–

Source: Индикаторы инновационной деятельности: 2009. Статистический сборник. М.- ГУ-ВШЭ, 2009.

Appendix 4. Gross Regional Product and Domestic Expenditures on Research and Development in 2007

	Gross Regional Product by subjects of the Russian Federation (gross value added at current basic prices) - total, mln .rubles	Domestic expenditure on research and development, thousand rub.
Russian Federation	**28254787,5**	**371080327**
Central Federal District	**10305111,2**	**206465206**
Belgorod region	241687,7	413536
Bryansk region	106144,3	196085
Vladimir region	148294,2	2163293
Voronezh region	228666,4	3223183
Ivanovo region	75785,1	293711
Kaluga region	114449,2	4131699
Kostroma region	68578,5	28394
Kursk region	132106,6	2461743
Lipetsk region	213774,0	67424
Moscow region	1306077,0	41136203
Oryol region	79790,5	339851
Ryazan region	126103,4	899418
Smolensk region	99140,8	674653
Tambov region	107595,7	873177
Tver region	158882,9	2806045
Tula region	176866,0	1006621
Yaroslavl region	189980,0	3890511
City of Moscow	6731188,9	141859661
North Western Federal District	**2788330,6**	**48087753**
Karelia Republic	104622,9	381590
Komi republic	242430,9	1253673
Archangel region	286861,9	793698
Nenets Autonomous District	98374,0	8695
Vologda region	243947,6	168208
Kaliningrad region	145920,6	717868
Leningrad region	312405,0	2598427
Murmansk region	192176,6	1629503
Novgorod region	87560,0	438884
Pskov region	63107,7	63226
City of St.-Petersburg	1109297,4	40042677
Southern Federal region	**2174836,3**	**12752468**
Adygeya Republic	29158,0	40761
Dagestan Republic	166720,9	437391
Ingushetia Republic	14834,8	8787
Kabardino-Balkariya republic	50385,2	283053

Kalmykia republic	16651,2	51536
Karachaevvo-Cherkessiya Republic	28239,1	205838
Republic North Osetiya-Alaniya	53667,9	174534
Chechen Republic	46782,2	40598
Krasnodar Kray	655298,3	2947891
Stavropol Kray	221118,8	460001
Astrakhan region	105062,9	330333
Volgograd region	333855,7	1768947
Rostov region	453061,3	6002797
Privolzhsky Federal District	**4391076,1**	**51207110**
Bashkortostan Republic	601310,1	2783152
Mary-El Republic	56391,2	248292
Mordoviya Republic	77003,3	371750
Tatarstan Republic	770729,6	4674049
Udmurt Pepublic	205824,4	523841
Chuvash Republic	121904,3	246868
Perm region	480022,6	5557775
Kirov region	120238,8	531006
Nizhegorodskaya region	473909,0	20227552
Orenburg region	375072,7	456120
Penza region	119905,3	1561022
Samara region	600367,9	9485801
Saratov region	261682,9	1506352
Ul'yanovsk region	126714,0	3033532
Ural Federal District	**4276047,3**	**21300081**
Kurgan region	82730,7	147321
Sverdlovsk region	825036,4	9738087
Tyumen region	2785335,6	5780295
Yamalo-Nenets Autonomous Distric	622747,6	191035
Chelyabinsk region	582944,6	5634378
Siberian Federal District	**3027504,4**	**23846673**
Altay republic	15317,8	55226
Buryatiya Republic	109554,1	289236
Tyva Republic	19776,4	98853
Khakassiya Republic	64029,2	43117
Altaysky Kray	223751,4	828729
Krasnoyarsk Kray	734413,9	4955645
Irkutsk region	403031,3	2484817
Kemerovo region	444352,4	494519
Novosibirsk region	382185,9	8392183
Omsk region	301802,7	2330704
Tomsk region	216059,2	3710725
Chita region	113230,1	…

Far Eastern Federal District	**1291881,6**	**7421035**
Republic Sakha	246469,1	1113005
Kamchatsky Kray	67917,8	746777
Primorsky Kray	263272,4	3375911
Khabarovsk Kray	232639,8	652822
Amursk oblast	114281,6	194903
Magadan oblast	35423,8	620517
Sakhalin oblast	286048,6	653034
Evreisky Autonomous region	24606,6	22507
Chukotka Autonomous District	21221,9	41560

Source: Регионы России. Социально-экономические показатели - 2009г.

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