

Evaluation of Innovation Potential of Belgorod Region Based on Complex Method

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Abstract: in development resources limited conditions the particular importance is the estimation of innovation potential of the regional economic system in order to optimize the implementation of innovation policy. We have developed a universal complex method of evaluation of regional innovation capacity, implemented in 3 phases; this evaluation method has been tested by us to calculate the innovation potential of the Belgorod region on the basis of statistical data.

Key words: innovation potential • Belgorod region • Evaluation of innovation potential • Complex evaluation method

INTRODUCTION

Innovative ideology as a system of ideas about the development and functioning of society is based on the value orientation, based on some of the basic postulates. The main of them is the need for a new way of thinking, people-oriented, able to create new knowledge and control on the basis of scientific and creative potential [1]. Another important postulate is the prestige and value of knowledge obtaining and development on the basis of a new culture of innovative thinking of both producers and consumers of innovations. Nowadays, the problem of transition to an innovation economy is relevant for the regions of the Russian Federation because of a number of reasons. Economy of knowledge and high technologies has to provide a significant part of the GRP growth is not only due to the industries directly producing high-tech products and intellectual services, but also from all industries, where food, process, marketing and organizational innovations are successfully applied.

Innovative development is a necessary for equitable entry into the newly industrialized countries for the Belgorod region. “The emerging regional innovation system with its innovation potential will ensure the establishment of the regional economy based on knowledge, it will facilitate the region participation of as an equal partner of the national innovation process”, - developers of the long-term development strategy of the

Belgorod region believe [2]. In fact the region specifically developed mining industry and agriculture in accordance with the socio-economic strategy, is being provided with adequate resources for a long period of time due to the trends of the time. The policy implementation of aim achievement outlined some results in this strategy yielded and allowed to achieve significant economic growth of Belgorod region and create favorable social environment. But at present, the global and national trends need to be revised of direction of development areas and new approaches to social and economic policy. Researchers consider the growth of innovation and high technologies are the key of sustainable and dynamic development and , in this connection, it is assumed that economic agents that do not devote enough attention to the innovation process will forever lag behind in their development in the long run. That is way, we believe that the Belgorod region should actively develop innovations in its territory and therefore the steps of the local authorities are justified and timely for the development of innovations.

The main source of the development of a new type is an innovation potential and indicators of the pace of this development can be seen as an opportunity for its effective use of the potential and the ability to sustain the level of innovation growth [3]. The relevance of innovation potential assessment is caused by the desirability of measurement of innovation policy

effectiveness for Belgorod region, because there are a lot of barriers to innovations identified in the region and statistical indicators of innovation development are currently remain unsatisfactory. In such a region as the Belgorod region, specializing in the development of resources (mining and processing of mineral resources, agriculture), imitating nature of innovation development can be a reason of significant developmental delay and movement into the category of unpromising regions, which serve as the resource base of more developed neighbors eventually. This situation fraught as the conservation of development intensity, growth and economic development reducing and the deterioration of living standards in the region, in addition to the potential loss of the unrealized profit from the effective using of disposable innovations.

The theoretical aspect of the methodology for innovation potential assessment. In this paper we have come to the conclusion that it is the best way to use efficiently the complex evaluation method that would integrate a variety of valuation techniques and allow operating on a multi-level system of private and integral indicators for such a complicated subject as an innovative potential of regional economic system [4]. We have developed an method of innovation potential assessment which consists of several steps, including different ways of describing, measuring and evaluation. In the first step we will conduct an analytical description of the basic conditions for innovation activity. The second step of our method is a peer review of the innovation infrastructure, innovation projects in the region and the institutional and legal determinant, the importance of which we discussed in the first section of this chapter. For the peer review of these factors, we developed a special matrix. The expert evaluation will be based on the available analytical data, as well as by identifying the level and dynamics of partial factors, the list of which was developed by us with regard to the objectives of the comparative method. The third step in our method is to build a radar chart, which will give us an idea about the innovative profile of the region and the calculation of the effective integral indicator of innovation potential on the basis of a comparison of actual and normative values.

Belgorod region is a region with a moderate level of innovation activity, the share of innovative products in the GRP stands at 2.6%, according to statistics the level of innovation activity of enterprises is 10.1%, i.e. only one in ten companies is engaged in innovative activities [5]. Well-developed scientific and educational complex that is able to ensure the development and implementation of

new technologies to existing and new businesses is an important advantage of the region. The Belgorod State University, which have received a National Research University status recently and BSTU named after Shukhov, which is the second largest architectural and engineering university in Russia for the quality of training for many years are the main elements of this complex. The universities in the region are preparing highly qualified specialists for all majors necessary for the conduct of high-tech business. The positive trend of the development of scientific and educational complex is created by a constant influx of young people from the region, as well as other regions of Russia and foreign countries, the best students and graduates enrich the scientific schools, high-tech enterprise, become the organizer of innovation business. We estimate that about one in 20 resident of Belgorod is a student or a graduate student (according to data of population census in 2010, according to which the population of Belgorod was 356 426 people). Four universities are training doctoral students in the region; there were 48 doctoral students in 2010, on average every three of them graduated with a doctorate thesis defense. Among the 455 state Russian universities BSTU took the 163rd place (63.9 points), BSU- the 174th (63.4 points) and Belgorod State Agricultural Academy took the 360th place (55.5 points) in the rating on the average marks being exam, which shows the level of knowledge of applicants who are studying for free; all the three Universities entered into a group of wealthy Russian universities [6].

The innovative development of the region will be the main priority of economic policy, as well as an additional source to cover potential losses of the crisis in the medium term [7]. This development will determine the specialization and allow the region to realize competitive advantages for its traditional industries (mining and metallurgy, agriculture, construction), as well as in new industries which are the basis of the development of innovation sectors of knowledge. The development of human capital, improving the living standards of the population, its level of education, health, creative and intellectual potential will continue on this basis. The implementation of the innovation scenario will lead to increasing of productivity and provide a long-term high-quality basis for the development and the formation of a class of creative, innovative motivated people.

It is necessary to increase the diversification of the economy on the basis of innovation, development and improvement of regional clusters and areas of advanced development for sustainable economic growth and to

neutralize the negative factors of the environment and fluctuations in market conditions. Formation of zones of advanced development will bring the traditional economic activities to a new level of technology and what matters is the role of small businesses as the most innovative and receptive business entity [8]. The development of an effective regional innovation system is a prerequisite for the competitiveness of the economy and should include the development of infrastructure, establishment of institutions of intellectual property, development of sources of innovation financing, creation of information and communication innovators environment. In this regard, first of all, a professional activities development to promote the development and implementation of innovative projects is needed, as well as the intellectual property market and its management system with a maximum protection of the relationships rights.

The economic development of the Belgorod region is characterized by steady growth, which can be traced in almost all key macroeconomic and macro indicators. Analysis of trends in the socio-economic development and measures to implement the priorities of economic policy adopted by a regional government can expect stable growth for the region. An investment area of the region is characterized by the strengthening of the positive trend of growth of financial investments, the highest amount of investment in 2010 accounted for industry, agriculture, housing and social services. The favorable investment climate will provide a promising realization of economic and social projects in the future. Given the progress made in the field of socio-economic results, we can say that the foundation created for the stable development of the Belgorod region. The growth rate of the economy will obviously stay at a high level, but there will be some decline in the preservation of the slow pace of innovation.

It is identified several aspects of the solution of the transition to the innovative development of the region based on the analysis of policy documents. The first is the feasibility of the innovation on the basis of its own culture and traditions, the second is the need to increase the value of intangible assets and the third is the development of a modern infrastructure for science and innovation, the fourth is to stimulation of the creation of non-state system of innovation financing, the fifth is the creation of packing and innovative infrastructure, the sixth is the feasibility of establishing an appropriate social infrastructure, the seventh is the problem of creating a system of staffing the innovation process. Nowadays it is being actively carried out to establish the Belgorod

intellectual and innovative system that will coordinate the implementation of innovative projects (corporation "Development", "Aurora Park", etc.) to solve this problem in the region.

Summarizing the results of our research of the conditions of innovative development of the Belgorod region, we should note:

- there is a local law on innovations and innovation policy, a strategy for socio-economic development until 2025, a Council on Innovation Policy at the Governor of Belgorod region are taken;
- innovative infrastructure provided by regional decrees and resolutions, targeted programs and other legal acts defining the ideology of innovation development;
- regional contests, programs and other mechanisms of financial support for innovative businesses provide funding at all stages of the innovation chain, the system of training and personnel for business innovation, business incubators of universities allow to commercialize ideas;
- in 2010 GRP was 397,069.9 million rubles;
- industry growth was 10% compared to the level in 2009;
- total cost of performing research and development from all sources in were amounted to approximately 891.7 million 2010, the budget was accounted for 50.4% share of these funds, while the share of costs in the gross regional product (GRP) was only 0.2%, a decrease of 0.1% compared with 2009;
- cost of technological innovations in enterprises and a whole region are 3,072.3 million rubles, 90% of these costs were financed by the enterprises themselves;
- amount of the economically active population was 779.9 thousand, while the number of employed population-739.1 thousand people, thus, the level of economic activity of the population in the region was 63.9%, the employment rate was 60.6%;
- innovation costs have increased by 176%, but the release of innovative products fell by 17%.

Particular indicators of the level of development and innovation potential using. We will calculate the number of individual indicators in the next phase of evaluation of innovative potential of the Belgorod region. The totality of these indicators will identify a resource component, i.e. to assess the security of the region's science and technology, human resources, finance, information and production potential [9]. In order to prepare the analytical

material “Science and Innovations of the Belgorod region in 2010” [5] Belgorod Statistical Office has been calculated the share of innovative products in companies sales in industry and the service sector, which accounted for 0,026 of the total, so that *the index of innovative products*, which is calculated as the share of innovative products in the GRP:

$$I_{in.prod.} = 2,6\%$$

The share of innovative enterprises in the total number of industrial enterprises and the service sector is the most important factor in the development and strengthening of a new economy. In this case we can calculate the *Indicator of innovation activity* as a ratio of business entities engaged in the transformation of the results of research and development in innovative product or dealing with organizational, marketing, social or environmental innovation by the total number of regional enterprises. However, at present the state of innovation statistics in the Belgorod region does not assess the overall level of innovation activity, in this regard the survey is not solid but selective. For example, there were surveyed 404 companies, including 308 industrial organizations in order to identify of innovative enterprises in 2010. The survey found that an average of one in ten companies carries innovation activity, that is why we can define innovative activity of enterprises of the Belgorod region as:

$$I_{in.act.} = 10,9\%$$

One of the key performance indicators of research and development stands *indicator of patent activity of the population*, which we will calculate as the number of patent applications by 10 thousand people of economically active population of the Belgorod region. There were received 117 applications for invention patents in 2010, 103 patent applications were for utility model and 11 patent applications for industrial sample, thus just 231 patent application were received, the number of economically active population, as we have said, was 779.9 thousand people, therefore:

$$I_{pat.act.} = 2,96$$

The personnel of the region innovation potential can be represented by the several, important indicators in our opinion. The share of students in the total number of employed in the economy ($I_{students}$), the share of research

employment in total employment in the economy ($I_{researches}$), the share of PhDs in the number of personnel engaged in research and development (I_{phD}) are based on the following data: the number of employed population-739.1 thousand people in 2010, the number of students-77,676 people, the number of personnel engaged in research and development-1,189 people, including 823 researchers, composed of researchers have been reported 45 doctors and 264 candidates of science, i.e. there were 309 researchers with advanced degrees in total:

$$I_{students} = 0,11$$

$$I_{researches} = 0,001$$

$$I_{phD} = 0,26$$

Important factors that allow assessing the region innovation potential are quantitative and relative indicators of scientific and technical components. Indicator of development level of scientific areas is internal expenditure on research and development and their share in gross regional product, so the *index of internal expenditure on researches and development* as % of GRP is:

$$I_{int.exp} = 0,2\%$$

Indicator of innovation activity in the region is the share of expenditure on innovation in the GRP, which is based on the data that the GRP reached 397,069.9 million rubles:

$$I_{innov.act} = 0,8\%$$

Eventually, we will calculate another particular indicator, which illustrates the innovative activity of the region. We can calculate the indicator of unit costs of research and development in science per employee in research and development:

$$I_{innov.costs} = 750\ 000\ rub.$$

Expert evaluation of innovative development conditions of the Belgorod region. The second step of our method is peer review, for which we have developed a special matrix (Table 1). We were able to assess the organizational and legal framework for innovation potential and to identify the main problems in this area as a part of this step of the evaluation based on the analysis

Table 1: Matrix of expert and ex-post evaluation

The institutional component		Rating	Comment
1.	Innovative legislation and legal regulation	satisfactorily	Evaluation Criteria: 25%-unsatisfactory, from 25 to 50%-satisfactorily, from 50 to 75%-well, from 75 to 100%-excellent.
1.	Organizational mechanism of the institutional system of innovations	good	Evaluation Criteria: 25%-unsatisfactory, from 25 to 50%-satisfactorily, from 50 to 75%-well, from 75 to 100%-excellent.
1.1.	market	+/-	Belgorod region is a region with a moderate level of innovation activity, an index of innovative products is 2.6%, an indicator of innovation activity-10.1%, innovation costs-0.8% of GRP
1.2.	intelligence	+/-	Every 20 th resident of the city is a student, 45 doctors and 264 candidates of sciences, patent activity indicator was 2.96.
1.3.	staff	+/-	The share of students in the total number of employed is 0.11, the share of employment in research-0.001, the share of PhDs in the number of personnel engaged in research and development-0.26.
1.4.	technology	-	The index of internal expenditure was 0.2% or 750 thousand rubles per employee.
1.5.	science	+	There are 16 organizations engaged in research and development in the region, some of which are the basis of formation of nanotechnology innovation system
1.6.	interface	+/-	There are just 13 organizations of the innovation infrastructure, venture capital funds, offices commercialization of them are not represented.
1.7.	information	+/-	The Innovation Forum, which identified gaps in the information field of innovation sector was firstly In the region
1.8.	declaratory documents	+	The Belgorod region law # 296 "About the innovations and innovation policy in the Belgorod region" was adopted at October 1 in 2009
1.9.	regulations and orders		Do not cover the full scope of government regulation of innovations
1.10.	program documents	+	Resolution of the Government of the Belgorod region # 27-pp "Strategy of socio-economic development of the Belgorod region for the period up to 2025" from January 25 (2010)
1.11.	private documents	-	There have not been accepted concept, strategy and innovation development program up to now.

of the conditions of innovative development of the Belgorod region and calculation of individual indicators. In particular, the problems such as the lack of "technology corridor", a special legal regulation, leverage risk reduction, low innovation activity and sensitivity, lack of integration of science and business, a public-private partnership, the lack of financial infrastructure to innovation support. The basic tools to overcome these barriers are target-oriented and project methods of region management, as well as the alignment of intellectual property management system for the optimal use of intellectual potential. The level of innovation regulatory in the region was estimated by us as satisfactory and organizational mechanism of innovation system was rated as "good".

The need to clearly indicate the evaluation criteria, which would cover all the aspects and characteristics of the regional economic system, is an important principle of our proposed integrated method for assessment the

innovation potential. Many researchers (for example, Vostrikova A.S. [10], Moskvina O.S. [11]) believe that so-called upper and lower bounds-standardized indicators of satisfactory and unsatisfactory state of the innovation potential of the region, developed by leading scientists of RAS are used as comparative evaluation criteria. Such an approach has its advantages, it has been tested as a part of the innovation potential evaluation in some regions of Russia and gave some results. However, we believe that, taking into account the concept of our research, this approach is too general and does not take into account the possibility of regional characteristics, specialization and individual development strategy of the Belgorod region, which are due to different levels of innovations. We believe that it is important to develop individual evaluation criteria for each of the region, based on the actual and the desired (ideal) level of innovation potential and innovation policy in this regard.

Table 2: Target indicators of innovative potential of the Belgorod region-actual and normative values

Index	2007	2010	2012	2020	2025
1 The share of employment in the economy, with vocational education, %	67,4	75,7	69	76	80
2 The share of the economy of knowledge and high technologies in the GRP, %	10	9*	11	17	20
3 The share of innovative products in total revenues, %	5,6	2,6	28,7	29,9	30
4 The share of companies implementing technological innovations in the total number of organizations, %	14,1	8,7	25	48	50
5 The share of companies implementing organizational and marketing innovation in the total number of organizations, %	4,8	4,2	10*	40*	45
6 Internal expenditure on research and development,% of GRP	0,2	0,2	2	7	9
7 The share of employment in small businesses in total employment in the economy, %	20,8	26*	29,6	37	40
8 The turnover of small and medium-sized enterprises-legal entities (in current prices),% of GRP	37,7	38,5*	38	40	42
9 The share of innovative products of small enterprises in total revenue of small businesses	1,2	2*	20*	30*	35
10 The number of received patent applications for intellectual property rights	230*	231	450*	600*	647
11 The number of issued patents of the Russian Federation	160*	169	300*	550*	727

* according to the expert evaluation

Systematic monitoring of the economic situation as a part of the program documents in the Belgorod region is carried out and measures aimed at enhancing the innovation process are realized. A number of target indicators characterizing the process of formation of a favorable social environment and conditions create for the effective realization of human potential and quality of life based on the dynamic economic development of the region are identified in the long-term development strategy of the Belgorod region, as well as a number of formation indicators of the institutional environment that induces an innovation activity and capital raising into the economy and the social sphere. We have selected 11 target indicators of socio-economic development of the region, directly characterizing the innovative potential of the region, taking into account the availability of statistical information for the calculation of actual values of these indices in the analyzed 2010. The achievement of the next level targets in 2012, in 2020 and in 2025 compared with the actual results of innovative development in 2007 will be the main outcomes of activities of the regional innovation system, according to the forecast of development strategy as a result of measures taken (Table 2). In addition we will calculate the actual value of these indicators in 2010, according to the available statistical and analytical data and we will tabulate the values for the comparative analysis of the results and intermediate, planned in the prediction results of innovative development of the region.

We will draw up the radar chart from the data presented in table 2 for the graphical illustration of regional innovation profile. The radar chart will assess the value of the starting (initial), the actual and the target (desired or ideal) innovation potential of the region, as

well as to trace the nature of the dynamics of this magnitude change. We will take 0 as a minimum axes as in principle unattainable condition, characterized by a complete lack of innovative potential of regional economy development. For the maximum value of the coordinate axes will adopt 1 as a criterion for characterizing the 100% target achievement, i.e. ideal state of the regional innovative potential or its desired level, fully satisfying the target benchmarks of innovation development. To calculate the coordinates of the points of building outlines an innovative profile of the region it is necessary to determine the level of actual performance to projected ideal of regional innovation potential, i.e. coordinates of *i* points of the innovative potential diagrams will defined as:

$$I = \frac{I_f}{I_n}, \quad (1)$$

I_f -the actual value of the index

I_n -the normative value of the index reflected in the Strategy of socio-economic development of the Belgorod region as an indicator of the development of regional innovation systems.

For the convenience of the domestic regional annual or quarterly monitoring of the innovation potential of the Belgorod region, we propose to use the resulting integral indicator (I), which can be calculated by formula (2), wherein the resulting ratio will be closer to 1, the regional innovative potential will be more:

$$I = \frac{\sum_{i=1}^m \frac{I_f}{I_n}}{m}, \quad (2)$$

m-the number of indicators used in the calculation.

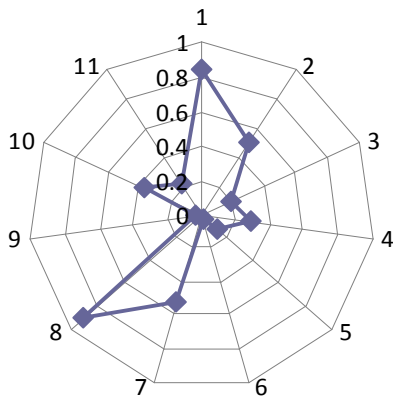


Fig. 1: The innovative profile in 2007

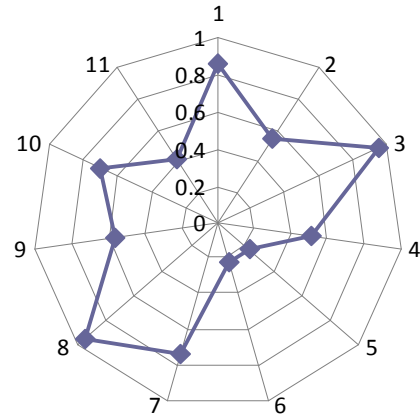


Fig. 3: The innovative profile in 2012

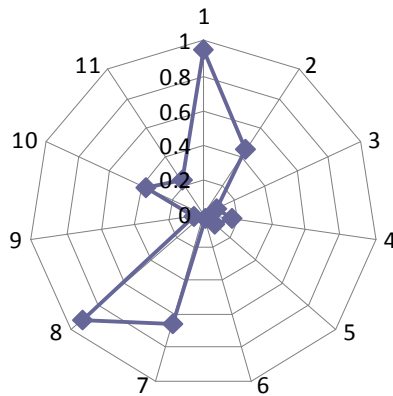


Fig. 2: The innovative profile in 2010

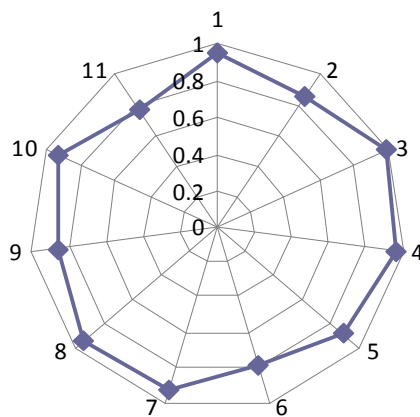


Fig. 4: The innovative profile in 2020

As can be seen from the table 2, the availability of statistical data allows us to calculate the integral potential of only 11 indicators, however, we believe that the purpose of our research will be enough and the result will indirectly assess the potential of regional economic system of the Belgorod region. The calculation showed that the result integral index is 0.36, which means that the objectives of innovation development achieved by the year 2010 more than a quarter.

CONCLUSION

In the course of our research we have found the need for a full-scale socio-economic research of innovative potential of the Belgorod region in order to prepare background material on its evaluation in the near future. We believe that the existing form and methods of official statistics do not fully reflect the real situation in the innovation sphere due to the several reasons. First, the lack of a unified approach to the definition of innovation activity on the part of public authorities, business and science is a serious problem in this regard.

Classical or resource-based approach is the most commonly used in various institutions of state structures, the integrated approach is more common in the scientific community and businesses area, but business representatives have focused on the commercial component of innovation and feature of innovation to make a profit, representatives of science are more interested in the type of innovation and the degree of its novelty. What is interesting, in accordance with the results of various surveys of enterprise managers on average about a third of managers of enterprises, officially belonging to the category of innovation, believe that they do not innovate and at the same time, about half of the business leaders who participated in the survey, who do not officially belong to innovative, believe that their businesses are innovative. Second, the statistics surveys include the limited number of parameters and conducted on a sample of sufficiently small number of enterprises. Some researchers [12] draw their attention to the problem of formalization of innovative and high-tech sectors of the economy of the region in the form of NACE codes. In particular, priority sectors of the regional development

strategy, including the strategy of socio-economic development of the Belgorod region is usually defined by a branch principle, but the statistical reporting is formed in the context of NACE. This raises the performance of enterprises, not related to innovation and vice versa.

Our estimation of innovative potential of regional economic system on the example of the Belgorod region gives us an indication of its general level and the availability and condition of the individual components. Our assessment method allows measuring the ability and capacity of the region to innovate on the basis of a relatively small amount of information and the limited set and, indirectly, to evaluate the effectiveness of innovation policy and the extent to which real innovation potential planned, predictable and desirable. However, this method does not give a detailed answer to the question about the cause of a mismatch between an actual value and innovation potential of the proposed and does not specifically identify the problem areas and weak points.

Findings: Nowadays the level of our knowledge about the mechanism of innovation, principles and innovative development laws do not permit to design a model of development of innovative type, which would show a final result with the set parameters changing. Thus, the optimal estimation methodologies are not represented in the present, so it makes sense to revert to the applicable common and well-known method of expert estimation. Therefore, we believe that in addition to the analysis of statistical data for the region is still important to use a special method of experts questioning (experts from the scientific and educational environment of the government agencies, as well as independent experts) and business leaders, are already engaged in innovations and ready to enter this market, in order to gather information about the state of the innovation potential of the region. Well-written survey methodology and the structure of sets of questions will fully assess the potential of the region and identify the problems in this regard. If you analyze and calculate the intellectual potential of universities, research institutions potential and innovation potential of enterprises separately, then the innovative potential of the region can be determined by their total amount, however, this value must be agreed with the level of development of innovation infrastructure and the level of innovation receptivity. Indeed, the accumulation of information and analysis experience in this area will further harmonize a monitoring of the impact of innovation policy with the feedback, the result of monitoring in order to adjust.

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