

Development of the Management and Incentive System for Innovation Activity of Enterprises in the Digital Economy

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ABSTRACT

The article explores innovative business strategies using a sample of enterprises. The author's method consists in comparing research expenditures and the dynamics of the indicators of financial reporting by companies. The author shows the results of applying the approach by identifying the 10 groups of enterprises, by the degree of participation of companies in the innovation process. This method provides low costs and more precision assessment and selection of enterprises for inclusion in the system of management and stimulation of innovation. For the successful operation of the system, the author proposes to solve four problems: reducing institutional costs, creating competitive industry clusters, improving the digital inclusion of enterprises and creating industrial digital platforms. The final part of the paper discusses the way to affect the business strategy of companies, which activates innovative impulses, directed at digital modernization of the Russian economy.

Keywords: *institutional environment, innovation activity, innovation system attributes*

1. INTRODUCTION

At the moment, digital innovations are providing the outperforming growth rates of economic development. The efficiency increase of the production process in different economic sectors is the goal of digital innovations. The competitiveness of an enterprise depends on the success of the innovation's implementation, adaptation of the new business models and management of entrepreneurial risks. A dynamically developing enterprise is permanently looking for ideas that could be commercialized [1] under the impact of advancements in technology. In connection with this, it is necessary to increase the innovative management effectiveness in enterprises as well as to create an industrial management system of innovation activities of enterprises. According to the author's point of view, one of the key tasks of such a system is to motivate enterprises to the introduction or the transformation of innovative strategies. Each innovative strategy creates an impulse, a growth point. Besides, it changes the institutional environment of entrepreneurial activity. The enterprise innovative strategy involves the use of external and internal resources for the creation and implementation of different innovation types. Along with it, other impulses create effective conditions for innovative development. The government regulations in the economy are the exact measures that provide the creation, extension, and stabilization of such conditions.

The existing set of measures of innovation government support is uncoordinated and local. Below we will list the

key objectives of government regulation, the accomplishment of which will allow to activate the innovation activity of enterprises:

1. Minimization of transaction costs arising in innovation activity, reduction of institutional barriers preventing the increase in the number of actively operating enterprises in the industry.
2. The unification of enterprises of different fields in one cluster, provision of the sustainable economic relations between the members of such a cluster.
3. Stimulation of digital «involvement» of enterprises, provision of external information and analytical base of entrepreneurial activity.
4. Provision of the cross-sectoral diffusion of new and existing technological paradigms among enterprises.

Along with this, the uncoordinated and fragmented actions have to be avoided. These are situations when one encourages not a system interaction with customers and suppliers in innovative projects, but ineffective interaction with external experts and consultants [2]. For the consistent accomplishment of the objectives set, it is necessary to have a target audience that will be able to follow recommendations and respond to innovative impulses and government regulation measures. Such an audience has to be built administratively according to the

approaches and the methodology for selecting and analyzing enterprises that are presented below.

2. METHODOLOGY

The following study is based on the systemic paradigm. According to this theory, a system can have a form of a set of subjects combined with comparable characteristics. Each system is characterized by having the features, status, functions and other signs. In this case, a feature is a set of homogeneous parameters of the system subjects. To effectively stimulate innovation, one has to select enterprises with appropriate parameters. Parameters should be evaluated according to the features that they form. A set of features form the general system's status. Along with the general system's status, there are local statuses of features which are formed according to the parameters of enterprises.

In the course of the study, the author adheres to the following hypothesis. Facts of financial and economic activity of enterprises are factors of innovation activity. These facts make up the parameters of financial statements, i.e. characteristics of the enterprise. The set of parameters arising from homogeneous facts creates the features of the system of subjects. The dynamics of features determines the system's status. The status and features of the system relating to the innovation, make up a methodological complex for the analysis of innovation sensitivity. Sensitivity is the overall ability of a system to change its features to achieve the desired result (in this case, it is the provision of the innovation activities of enterprises) [3].

The object of study is a system of enterprises. According to the specified signs we have selected 120 enterprises operating in the Krasnodar Krai, which have been declaring their scientific-research expenses in the analyzed period (2009-2018). The subject of analysis is the individual parameters of the financial statements of enterprises from the selection. The objective of the study is to identify changes in innovative strategies of enterprises, and signs which determine the degree of involvement in innovation activities. The result of the study is the proposal of enterprises' groups for the involvement in the system of stimulation of innovation activity in the conditions of the digital economy.

The technology of selection and analysis of innovation activities of enterprises can be presented as follows. First of all, one has to create a selection of enterprises based on general criteria that improve selection accuracy. Among such criteria, the author specifies a high level of research & development expenses, reporting of these expenses in the financial statements for at least two periods, reporting of such expenses in different types of financial statements, the presence of a financial result in the period of research & development and some other signs. In the second stage,

one has to study the features of a selection of enterprises that, in the author's opinion, have an impact on the innovation process. In particular should be determined the dynamics of the parameters of enterprises, comparison of the parameters with the fact of either presence or absence of research & development in the reporting period, and the assignment of local statuses. In the third stage, one has to make up an array of local statuses which are calculated by particular rules. At the fourth stage, one has to pass the expert judgment about the type of innovation strategy for each enterprise according to the obtained sequence of local statuses of the enterprise parameters.

Specific provisions of the methodology are as follows:

- 1) each parameter change is compared with its previous state. The presence of the parameter's increase or decrease is compared with the presence of the research & development fact during one reporting period;
- 2) indicators of financial statements that, according to the author's opinion, have an impact on the innovation, are referred to the properties in table 1;
- 3) technical analysis is performed in a spreadsheet editor with the use of the "if" logical operator in the formula and is finished with the assignment of a local status;
- 4) a local status is assigned to each analyzed parameter of the subject divided up by period;
- 5) three main encoded values are assigned to the parameter according to the following rules:
 - the «+1» value is assigned in case of an increase in the parameter of financial statements and the presence of the of research & development fact,
 - the «-1» value is assigned in case of an increase in the parameter of financial statements and the absence of the research & development fact,
 - the «0» is assigned in case of the absence of positive changes in the indicator of financial statements and the research & development fact.
- 6) four auxiliary encoded values are assigned to the parameter according to the following rules:
 - the «budget» value is assigned in case if the research & development of the enterprise is financed from the government budget along with the simultaneous deterioration of the financial statements' indicators;
 - the «research & development is absent when the feature deteriorates» value is assigned in case if at the same time there are no research & development expenses and the compared indicator of the financial statements of the enterprise decreases;
 - the «does not function or is not created» value is assigned in case of zero indicators of the enterprise's financial statements;
 - the «the initial analysis period and research & development are absent» value is assigned in case of the absence of research & development during the initial reporting period of the analysis (i.e. in 2009).
- 7) the type of innovation strategy is determined by the obtained sequence of encoded values. The most effective innovative strategies have the enterprises that have the most local statuses of the «+1» type. Those enterprises that

have the most local statuses of the «-1» and other types

have the least effective innovative strategies.

Table 1 Subsystem features of the innovatively active enterprises

| Indicators of financial statements | Feature |
|---|-------------------------------------|
| Property, plant, and equipment | Logistics and maintenance support |
| Intangible assets | Commercialization |
| Long-term loans and credit lines | Investment attractiveness |
| Short-term loans and credit lines | Commercial sustainability |
| Profit and prime cost from sales | Profit margin |
| Profit before tax | Enterprise efficiency |
| Profit and cost of sales | Adaptation to the market conditions |
| Amounts of the delivered research & development services exempted from taxation | Research and production cooperation |
| Research & development expenses | Innovative susceptibility |

Source: Compiled by the author

The essence of the proposed method is in the codification of the parameters' dynamics in the financial statements of the enterprises as well as in the simplification of the evaluation of innovative business strategies. Besides, the suggested method allows determining the effectiveness of research & development expenses for the whole enterprise more accurately without the use of surveys and interviews, thus reducing the evaluation subjectivity.

3. RESULTS OF THE RESEARCH

As a result of the work performed, we have selected and systematized the parameters of financial statements of 120 organizations operating their activities in 12 industries (recreation and tourism; mechanical engineering and metalworking; transportation; construction; agriculture, etc.). The greatest number of enterprises in the Krasnodar Krai that meet the selection criteria operate either in the research and engineering sphere (21 enterprises) or in the production of machinery and equipment (19 enterprises). The smallest number of enterprises in the Krasnodar Krai, which were picked for the selection, conduct their activities in the service industry (tourism, transport, and public services). The compiled matrix of parameters and encoded values of local statuses allowed us to make a horizontal and vertical analysis.

Vertical analysis has shown that the enterprises that have developed material and technical infrastructure constantly incur research & development expenses. Thus, having the assets adjusted for the research & development performance is more important for innovation than the current enterprise profitability, the profit dynamics, and the production cost.

Horizontal analysis has shown typical innovative strategies. All in all, the author identified 10 groups of enterprises united by similar strategies:

1. Stable innovative activity in the analyzed period either with the presence or with the absence of research & development results in the form of an intangible asset (12 subjects).

For enterprises of this group, innovative development is an integral part of management, which firmly takes its place in long-term and short-term planning of business activities.

2. Sustainable innovation activity (three or more years) occurs after a long period of absence of the research & development expenses, or vice versa (subjects). This group of enterprises is the implementation of investment projects. That is, there is a particular cost budget in different spheres, a part of which makes research activities.

3. Stable innovative activity in the analyzed period, partially supported by government budget financing (10 subjects). Companies are assumably executing government orders and are demonstrating positive financial results.

4. Unstable innovative activity in the analyzed period: recurrent expenses on research & development with a governmental financing source, which resulted in the creation of intangible assets (3 subjects). A financially sustainable enterprise from time to time executes government orders for innovative developments and operates in the economic complex.

5. Unstable innovative activity in the analyzed period: partial completion of research & development by the creation of intangible assets against the backdrop of deteriorating financial statements' parameters (24 subjects). The insufficient experience in planning research & development expenses leads to mediocre results and has an ambiguous effect on the parameters of the enterprise's financial statements.

6. Irregular innovation activity in the analyzed period: incomplete research & development with a deterioration of financial statements' parameters (5 subjects). The enterprises that fall into the group have unstable development. The conduction of unsuccessful research and

development periodically make resultless attempts to change the situation for the better.

7. Insufficient innovation activity in the analyzed period: incomplete research & development, partially financed by the governmental budget (4 subjects). The company is not financially stable, depending on government funding. The enterprise management is not interested in the effective business model.

8. Insufficient innovation activity in the analyzed period: few research & developments completely financed from the governmental budget (16 subjects). The enterprise to a certain extent belongs to the state or completely depends on the governmental order.

9. Minor innovation activity in the analyzed period: incomplete research & development and poor indicators of financial statements (32 subjects). The enterprises that fall into this group have only a few research works, and their business activity is almost not maintained.

10. Imitation of innovative activity in the analyzed period (4 subjects).

In this group, some enterprises specify their research & development expenses in their financial statements against the backdrop of a decrease or stagnation of other parameters. From this point, the author concludes that these costs are by their nature not connected to innovation and are ordinary enterprise expenses.

Thus, the separation of enterprises from the primary selection into individual groups allows us to point out enterprises that:

- can become the flagships of innovative development in their industry (18%);
- have innovative potential and need help to implement it (28%);
- have recently started gaining innovation experience (7%);
- have valuable experience of mistakes and unsuccessful research activities (43%).

Each of these groups of enterprises will contribute to the establishment and operation of a stimulation system of innovation activities.

Up to 25% of enterprises that have shown innovation activity from 2010 to 2014 stopped their entrepreneurial activity during 2015-2017. Most of the liquidated enterprises conducted their activities in the three following sectors:

- natural-science and technology research (23%);
- public services (16%);
- production of construction materials, works, and services (16%).

Along with this, some researches [4], on the contrary, show that innovatively active companies have a higher chance of survival, which additionally points to major institutional obstacles in the Russian conditions to the positive completion of research & development. The factor of the regional institutional environment greatly influences the innovation activity [5].

The author concludes that the listed patterns are a consequence of the business model, in which the separate untypical activity areas of the enterprise are implemented

with the help of outsourcing. The additional contribution to the general low research & development performance can make the excessive trust of enterprise managers to researchers and project teams with which they had the experience of working together. According to research made by A.C. Schulze-Krogh [6], personal knowledge, or proximity to the scientific-research environment are determinative in choosing partners for an innovative project.

4. DISCUSSION OF RESULTS

The suggested proprietary methodology of the analysis allows us to more objectively evaluate the real consequences of research & development expenses for each enterprise, as well as to eliminate subjective contortion of facts and obtained results. Apart from this, the implementation of the methodology requires minimal administrative overheads. The shortcomings of the methodology include indistinct causal relationships between research & development and the dynamics of the financial statements' parameters.

Conclusions about innovative strategies may be improper if one analyzes only a short period of the enterprise's activity.

However, all the above - listed shortcomings are not that important for the system of innovative activity stimulation of enterprises. In this case, the organization and observance of the following conditions are of greater importance.

First of all, irrespectively of the concentration degree of innovatively active enterprises in different sectors, one has to perform the work aimed at lowering the institutional obstacles to innovation. In practice, this means the analysis of the effect of administrative, organizational, information overheads, as well as information and legal security overheads on the innovative activity of enterprises. The objective of government regulation in this field should be to ensure a high chance of acceptable success of research & development expenses for enterprises.

Secondly, the benefit from the interaction of enterprises representing different types of work and services required at each stage of the innovation process should be increased. Creation of a cluster, the core of which makes a large enterprise-leader from the first group of innovative activity and associated groups of smaller companies is pretty useful in this case. The operating innovative enterprise itself can better produce and train the next generation of innovators [7] than a business incubator or a university. What's more, the increase of innovatively active enterprises' concentration increases the chance of an innovative combination of ideas and resources [8]. Nevertheless, according to parametric research by P. Mendi [9], one should expect that the leading company is likely to keep its motivation for the improvement of products with the help of innovation.

The leading cluster companies should make the production processes digitalized. Besides, they have to

develop the IT environment around them. The work in this direction has to be organized according to a simple principle: everything that can be digitized must be digitized. The requirements for electronic - computer organization of counterparties' business will increase the general level of digital involvement of enterprises.

This is the way of how the conditions for the implementation of the third objective of the innovation stimulation system have to be created. This objective implies the creation of a global multilevel IT environment based on advanced digital technologies. Work with the target audience of enterprises will lead to the maintenance of a technical, digital, organizational solutions' register that will allow reducing costs, the loss rate of the initial stages of the innovation process as well as to prevent errors that have been already made by industry participants [10].

All in all, according to the results of the conducted research, the author comes to the following conclusion. The innovative activity of enterprises in the territory of the Krasnodar Krai is low and the effectiveness of research & development is insufficient. The incurrence of these expenses is rather negatively than positively affects the parameters of the financial statements for most enterprises. In this connection, only a few companies have the forward innovative business strategies, so the innovative potential remains unrealized. The use of the described methodology allows evaluating the effectiveness of previously existing measures of innovation development support rather comprehensively and objectively. In the author's opinion, the previous government regulation mechanism should be combined with forward-looking measures and means of the economy digitalization increase into a general system of stimulating the enterprises' innovational activities.

The research can reasonably be continued in the sphere of the evaluation of the impact effectiveness of innovative impulses on the economic systems. Such impulses occur during the implementation of industrial projects on the stimulation of the innovative activity of enterprises. Along with this, a more advanced means of such evaluation is the methodological complex of innovative sensitivity analysis.

5. CONCLUSIONS

The presented research analyzes the innovative activity of enterprises according to the indicators of financial statements collected in the FIRA PRO information resource. According to the results of the research, the author found out that only 18% of enterprises conducting research & development activities have the level of preparedness, which is high enough for participating in the industry project on innovation stimulation. Forty-three percent of enterprises have to make an authoritative analysis of the errors made and systematize all the identified problems. Their example can be helpful for the implementation of the first objective of government regulation, which is the reduction of institutional expenditures as well as the lowering of obstacles to

innovative activities of enterprises. Fifty-three percent of innovatively active enterprises can respond to innovative impulses. A special system of government stimulation and management of innovative activities of enterprises should be created. Such a system should be capable of ensuring a high level of such impulses, as well as the implementation of new institutional standards, and the increase of the digital involvement of enterprises. This system has several management levels, each of which meets a particular objective of government regulation:

- reduction of institutional expenditures;
- clustering and creation of sustainable production "chains";
- increase of the digitalization or the entrepreneurial activity.

The highest level of an innovation stimulation system of the enterprise's activities is the operation of a digital platform. All described stages and conditions work most effectively when there is a steady influx of new innovatively active players in the industry. To do this one will need a business constructor that will provide an opportunity for the remote production and marketing of goods, works, and services. It means that a set of virtual services that expedite the intensity of business processes should be made available to the unidentified circle of individuals and communities. The digital platform is aimed at simplification of the creation of the original combination of available resources in each separate case. These resources allow implementing the prototype, project, and business idea with the lower expenditures and greatest speed. Without a digital platform, one cannot switch from an isolated innovative organization of the economic system to the solid one. The diffusion of innovative technologies will be impossible as well.

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