

Rubric 4. TRANSPORT ECONOMICS

UDC [УДК] 336.5.01

DOI: 10.17816/transsyst201952118-129

© **Ia. V. Sokolova**

Emperor Alexander I St. Petersburg State Transport University
(St. Petersburg, Russia)

ON ASSESSMENT OF INFLUENCE OF INNOVATION ACTIVITIES RESULTS ON THE NATIONAL ECONOMY

Background: Development of Science in Russia is currently in urgent need of a thorough support from the state. Fundamental researches create ground for detalisation of innovative ideas and bring them closer through applied research to their developments and implementation. Ensuring sustainability of the country's economy is possible only through contributing resources to researches of immediate relevance.

Under existing conditions, special relevance is acquired by development of tools for assessment of additional effects of financing innovative development.

Aim: The purpose of this study is to assess the impact on the national economy of the costs on innovative development of companies.

Methods: Search for and analysis of:

1. options of assessment of available information about results of scientific researches (both patented and those that are not officially registered as intellectual property);
2. ways of deriving economic benefit from owning scientific researches' results with absence of opportunity for their introduction into a company's activity or for selling.

To assess the influence of expenses for innovative development on the national economy, the index of innovation support for the national economy (ISNE) is suggested to be used.

Results: The algorithm for calculation of ISNE is presented. It is suggested to consider relevant for calculation those expenses of the companies, that work on development independently or with the help of national knowledge generation sector and higher education. These expenses are for:

- salaries, considering premium;
- procurement of national equipment and materials;
- paying for work carried out and services rendered by contracted companies.

All other expenses at this stage are suggested to be deemed as irrelevant.

The factor can be calculated for each company-resident, irrespective of type of activity and field of scientific researches for ID purposes.

Conclusion: For companies that investing considerably in scientific and technical, innovative development, the increase of ISNE can be an additional incentive (with governmental support), will help in drawing attention to existing potential of the Russian science, save and multiply number of scientific schools, maintain high quality of scientific development and their effectiveness.

Keywords: innovative development, assessment of results of scientific research and engineering activities, index of innovation support for the national economy

Рубрика 4. ЭКОНОМИКА ТРАНСПОРТА

© Я. В. Соколова

Петербургский государственный университет путей сообщения
Императора Александра I
(Санкт-Петербург, Россия)

ОБ ОЦЕНКЕ ВЛИЯНИЯ РЕЗУЛЬТАТОВ ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ НА НАЦИОНАЛЬНУЮ ЭКОНОМИКУ

Обоснование: Развитие науки в России сегодня остро нуждается в комплексной государственной поддержке. Фундаментальные исследования создают основы для детализации инновационных идей и через прикладные исследования приближают их к разработкам и внедрению. Обеспечить устойчивость экономики страны возможно только при условии вложений ресурсов в актуальные научные исследования.

В сложившихся условиях особую актуальность приобретает разработка инструментов оценки дополнительных эффектов от осуществления расходов на инновационное развитие (ИР).

Цель: Оценка влияния на национальную экономику расходов на ИР компаний.

Методы: Поиск и анализ

1. вариантов оценки имеющейся информации о результатах научных исследований (как запатентованных, так и не имеющих официального статуса зарегистрированной интеллектуальной собственности);

2. способов получения экономической выгоды от обладания результатами научных исследований при отсутствии возможности внедрения их в деятельность компании или продажи.

Для оценки влияния на национальную экономику расходов на ИР предлагается использовать показатель инновационной поддержки национальной экономики (ИПНЭ).

Результаты: Предложен алгоритм расчета показателя ИПНЭ. Релевантными для расчета предлагается признавать расходы компании-резидента, самостоятельно ведущей разработки или с привлечением отечественного сектора генерации знаний и высшего образования:

- на выплату заработной платы с учетом страховых взносов;
- на закупку оборудования и материалов отечественного производства;
- на оплату работ, услуг сторонних организаций.

Все остальные расходы на данном этапе предлагается считать нерелевантными.

Показатель может быть рассчитан для любой компании-резидента независимо от вида деятельности и направленности научных исследований в целях ИР.

Заключение: Для компаний, осуществляющих значительные вложения в научно-техническое, инновационное развитие, увеличение показателя ИПНЭ может стать дополнительным стимулом (при мерах государственной поддержки), позволит обратить внимание на существующий потенциал российской науки, сохранить и приумножить количество научных школ, поддерживать высокое качество разработок, их результативность.

Ключевые слова: инновационное развитие, оценка результатов НИОКР, показатель инновационной поддержки национальной экономики

INTRODUCTION

In the conditions of external and internal crisis phenomena the necessity of advanced growth, qualitative economic development acquires special importance. It is possible to ensure the sustainability and development of the country's economy only if resources are invested in relevant scientific research.

Russia ranks ninth in the world in terms of total science financing (in purchasing power parity) with \$47.2 billion, behind the United States (\$543.2 billion), China (\$496.0 billion), Japan (\$170.9 billion), Germany (\$131.2 billion), the Republic of Korea (\$59.9 billion), France (\$67.7 billion), the United Kingdom (\$49.3 billion) and India (\$47.2 billion) [1].

It is important not only to declare the need to realize the scientific and technical potential, but also to provide support at the state level through budget funding, development of a set of measures to encourage companies to carry out R&D on their own or with the involvement of specialized scientific institutions. In addition, the qualitative level of conducted research aimed at obtaining a specific result that can make a significant contribution to accelerating the withdrawal of the Russian economy from the stage of stagnation, which, according to the report at the Moscow Academic Economic Forum (MAEF-2109) by A. G. Aganbegyan, has been in place since 2013 [2].

Today, the consequences of the current destructive trend of loss of scientific schools are underestimated, the preservation and development of which, as a mechanism for the creation and dissemination of knowledge, is an essential condition for ensuring high quality and depth of research, increasing its effectiveness through the introduction and commercialization.

Fundamental research creates the foundations and prerequisites for the detailing of innovative ideas and brings them closer to development and implementation through applied research.

One of the aims of this study is to draw attention to the urgent need for comprehensive governmental support of scientific and technical developments.

METHODS

Today, companies that are undertaking developments for the purpose of improvement of their business, increase of their competitiveness, enhancement or maintenance of their market share, and entry into new markets are seeking innovative development (ID), are faced with the challenge of assessing the cost effectiveness of such developments.

S.I. Ozhegov's explanatory dictionary defines development as a process of natural change, transition from one state to another, more perfect; transition from the old qualitative state to the new, from the simple to the complex, from the lowest to the highest [3].

In innovative development the desire to accelerate and intensify the transition process dominates.

In the explanatory dictionary "Innovation activity", the term "ID" means the transformation of all spheres of the economy and social system on the basis of scientific and technical achievements [4].

Scientific and technical progress plays a crucial role in addressing significant social and economic challenges, such as improving working conditions, reducing the burden on the environment, improving the living standards of the population, and is inseparable from the achievements of innovation activities.

According to Rosstat, the main indicators of innovation activity are as follows:

- innovation activity of organizations;
- the specific share of organizations engaged in technical innovation in the total number of companies being evaluated;
- data about shipped goods of own production, including innovative goods, works and services;
- costs of technical innovations;
- the specific share of technical innovation costs in the total volume of goods, works and services delivered;
- the specific share of organizations engaged in innovation (organizational, marketing, environmental) in the total number of evaluated organizations¹ [5].

Rosstat annually carries out work on systematization of data about science, innovations, formation of indicators of efficiency of the Russian economy, including the index of labor productivity in the main sectors of the economy and regions of the Russian Federation, the share of high-tech and science-intensive sectors of the economy in GDP and GRP, and others.

Annually, data are collected on the organizations (number, type, sector of activity) that carry out scientific research and development, on the number of personnel deployed in research, financing of science from the federal budget, types and volumes of internal expenditures distributed among the constituent entities of the Russian Federation, types of economic activities, priority areas and socio-economic goals.

According to Rosstat data for 2017, the innovation activity of organizations is estimated at 8.5 %, with the share of organizations engaged in technical innovation – 7.5 % in the total number of surveyed organizations.

¹ As to the annual report on federal statistics monitoring №4-innovation "Information about innovative activity of organisations".

Table 1. R&D costs in the Russian Federation [5]

	2000	2005	2010	2015	2016	2017
Internal current R&D costs by types of costs in the Russian Federation in million rubles						
Internal current R&D costs - total	73873.3	221119.5	489450.8	854288.0	873778.7	950257.0
including:						
wages	27762.7	94274.4	241472.2	398143.7	402793.5	437788.8
insurance payments for OPS, OMS, EHS (pension, medical and social insurances)	10419.2	22597.4	47904.6	104167.6	105441.3	114318.8
equipment procurement	3433.4	9936.2	18067.7	28480.2	24412.2	21750.6
other material costs	17470.9	51304.4	89279.0	157810.4	174467.8	186670.1
other current costs	14787.2	43007.1	92727.3	165686.1	166663.9	189728.6
Financing of science from federal budget¹⁾, million rubles						
Civil science costs covered by federal budget	17396.4	76909.3	237644.0	439392.8	402722.3	377882.2
In per cent:						
to the federal budget expenses	1.69	2.19	2.35	2.81	2.45	2.30
to GDP	0.24	0.36	0.51	0.53	0.47	0.41
Calculated values						
Share of financing of current science expenditure from the federal budget, %	23.6	36.5	47.7	51.5	46.1	39.8
Dynamics of annual change of internal current science expenditures, rate		1.18	1.06	1.07	1.02	1.09

¹⁾ 2000–2006 – in accordance with the Appendix 2 to the Federal Law “On federal budget”; 2007–2017 report of consolidated budget of the Russian Federation and budgets of state non-budget funds (as to the data by Federal Treasury; as to the 1st of January following the reporting period).

On the whole, in 2017, the internal current expenditures on R&D in the country, including those financed from abroad, but excluding payments made abroad, amounted to 950,257 billion rubles, of which 14.9 % were allocated to fundamental research, 18.1 % to applied research, and 67.0 % to development.

Funding science from the federal budget amounted to 39.8 % of the total internal current expenditures, which are distributed by the main types: wages, insurance payments for OPS, OMS, EHS, equipment procurement, other material costs and other current costs.

The data presented in Table 1 over the last few years testifies to a constant increase in the amount of funding, as well as changes in the share of funding for scientific research and development from the federal budget. Under the

conditions of domestic crisis phenomena that occurred in 2000, the size of this value had the minimum value – 23.5 % of internal current costs, the maximum – in 2013 – 64.9 %.

The current amount of funding of scientific and technical activities does not allow to provide a breakthrough necessary to bring the Russian economy out of stagnation for further growth.

According to S. Yu. Glazev's report presented at the 2019 Moscow Academic Economic Forum (MAEF-2019), according to the international assessment of the ratio of domestic spending on research and development in Russia and the countries of the Organization for Economic Cooperation and Development, Russia ranks 21st with a figure of 1.12 % of GDP, the first place is occupied by Israel with a figure of 4.38 % [1].

The Israeli experience of commercialization of scientific developments deserves special attention.

An integrated approach to the development of innovations in Israel has made it possible to take one of the first places in the world in terms of attractiveness for the implementation of developments, startups and projects at the stage of growth.

Today, one in five high-tech companies listed on the NASDAQ New York Stock Exchange is an Israeli or former Israeli company. There are more Israeli companies listed on NASDAQ than all European companies combined [6].

According to expert estimates, the level of implementation of the results of scientific developments in Israel reaches 25 % [7].

Obtaining such an assessment in Russia is not possible because of the lack of relevant source data, according to some experts this indicator is close to zero.

RESULTS AND DISCUSSIONS

The Recommendations on the development of innovative development programs of joint-stock companies with state participation (hereinafter – the Recommendations) [8] define the main objectives, such as promoting modernization and technical development of companies by significantly improving the basic indicators of efficiency of production processes, including reducing the cost of products (services) by more than 10 %, saving energy resources at least 5 % annually, improving the consumer properties of the proposed product, increasing labor productivity

The main figures (indicators) of ID programmes in the Recommendations are grouped as follows:

- 1) Indicators of R&D funding and performance (amount of funding from own funds, number of patents developed and implemented in the production of technologies in units);

- 2) Indicators of technological leadership (number of patents protected by patents of products obtained in the last three years, quality of the innovation portfolio, determined by the ratio between breakthrough and improvement projects);
- 3) innovation activity efficiency indicators (percentage of sales of new products, not older than three years, in the total sales volume, implementation efficiency);
- 4) performance indicators of the corporate innovation management system (number of innovation proposals, projects of employees and their expected payback potential, number of dynamically developing projects in operation, duration of the innovation process cycle or its individual stages);
- 5) indicators of efficiency of interaction with external sources of developments and innovations (number of innovation proposals from outside organizations, percentage of sales from the implementation of developments received from outside).

Obtaining data on the recommended indicators allows us to quantify the result of the implementation of recognized in the market specific innovative developments that can generate cash flow from sales.

At the same time, there is a difficulty in assessing the results of those developments, the results of which are not directly introduced into the production process, are aimed at improving the qualitative and/or quantitative characteristics of the company's activities.

In this case, the evaluation parameters are the results in the form of intellectual property rights (utility model patents, inventions, etc.). At the same time, it is possible to assess the economic efficiency of a patent for which royalties are not paid only by experts.

Thus, the need to develop tools to encourage companies to increase their spending on ID becomes particularly important.

Today, when assessing the internal current costs of research and development, the article "Other material costs" takes into account the cost of purchased raw materials, materials, components, semi-finished products, fuel, energy, works and services of production character and others [5]. At the same time, the costs of purchase of imported and domestic material values are not allocated. Expenses for payment for works and services of co-executing companies are not separately reflected, the status of residence is not taken into account.

Recommendations prescribe that when creating an innovation management system, one should take into account the need to significantly expand the implementation of research and development results by companies in the domestic sector of knowledge generation and higher education [8]. At the

same time, it is impossible to track the implementation of this provision due to the lack of benchmarks and insufficient data collection provided by Rosstat.

The proposed approach to assessment of the level of R&D expenditure is aimed at developing a list of incentive measures to ensure sufficient funding for science.

Costs of scientific research, as well as the initiation and creation of innovations to accelerate the development of the company's activities, organized by the resident company or carried out by Russian scientific organizations, affect the national economy, ensuring its development through the implementation of the results of scientific developments.

Salaries are paid to researchers, scientists, engineers and specialists involved in development, overheads are covered, materials and equipment are purchased for work, and taxes are accrued. In addition, travel, service and transportation costs, communication fees, etc. may be provided for.

It is proposed to use the indicator of innovation support of the national economy (ISNE) for the universal assessment of the impact of expenditures on the national economy on the ID.

The issue of calculating this indicator is disputable. The proposed author's approach can be improved in the course of the expert community's discussion of calculation options.

It is proposed that the costs of a company that is independently developing or involving the domestic knowledge generation and higher education sector be considered relevant for the calculation:

- Salary payment including insurance premiums (to PF, FSS, FFOMS, TFOMS funds), both for regular employees from the organization's payroll fund and those involved in civil law contracts;
- procurement of national equipment and materials, since the effect on the economy of the country in which the survey was calculated;
- payment for works and services of third parties. Often it is necessary to involve co-executing companies to carry out the work, and it is proposed to take into account such expenses with the coefficient of 0.5 in case of involving a resident company as a co-executing company. The use of the reduction factor is justified by the fact that, first of all, the costs of payment for works and services of third parties provide the overall result, and the main contractor is responsible for the actions of the co-executor, as for its own. Secondly, the co-executor is a third party, whose contribution should be taken into account in the assessment of the impact on the national economy of the company-customer in a smaller amount. In case of the contribution of third parties more than 50 % of the total amount of expenses, the choice of the executor of the work becomes incorrect, as most of it is carried out by third parties.

All other costs, even taking into account the likely significant share in the total volume, are not considered relevant at this stage.

The list of selected cost items with the order of calculation of their impact on the generalized indicator of the ISNE is shown in Table 2.

Table 2. Expenditures' items and order of calculation of IPNE (first stage)

Indicator	Calculation basis, unit of measurement	Values scale
Wages and ESN (common social tax)	Wages Fund (FOT) + civil employment contracts + ESN, million rubles	1 for each million rubles
Procurement of national equipment and materials	Cost of purchase of inventory, excluding VAT, million rubles	1 million rubles
Payment for the works of third party organisations (residents) – no more than 50 % of the total sum*	Contractual costs, VAT excluded, considering 1/2 coefficient, million rubles	0.5 million rubles

* If the amount of expenses for third parties exceeds 50 % of the total expenses, this indicator is assigned a zero value.

The obtained digital value characterizes the level of expenses for obtaining a new product, service, process, which differ from the existing ones in order to increase the efficiency of activity.

At the second stage of calculations it is necessary to take into account the degree of implementation of the results obtained in the course of scientific works.

This is proposed to be done with the help of an implementation factor:

- the results were fully implemented in the company's operations – 1.0;
- results partially implemented – 0.5;
- results were not implemented – 0.

By multiplying the value reflecting the level of expenditure within the national economy and the implementation factor, we obtain the IPNE index, which allows comparing companies of different types of activities and with different scale of innovative development and its productivity.

The indicator can be calculated for individual companies, industries, regions and countries, provided that the necessary initial data are available.

CONCLUSION

The purpose of the new indicator is to provide additional control at the national level over the processes affecting the national economy in order to

create a system of state support for companies willing to increase their R&D costs.

For companies that make significant investments in scientific, technical and innovative development, the increase of this indicator may become an additional incentive, it will allow to pay close attention to the existing potential of the Russian science, to preserve and increase the number of scientific schools, to maintain the high quality of developments, to increase their effectiveness.

Библиографический список / References

1. Глазьев С.Ю. Трансформация международных отношений в условиях смены технологических укладов. Доступно по: <http://www.myshared.ru/slide/983569>. Ссылка активна на 05.07.2019. [Glaz'yev SYu. Transformatsiya mezhdunarodnykh otnosheniy v usloviyakh smeny tekhnologicheskikh ukladov. [Internet]. [cited 2019 Jul 05]. Available from: <http://www.myshared.ru/slide/983569> (In Russ.)].
2. Московский академический экономический форум «Перспективы социально-экономического развития и роль науки: академический дискурс». Доступно по: <http://www.veorus.ru/maef/about/> Ссылка активна на 25.05.2019. [Moskovskiy akademicheskiy ekonomicheskiy forum "Perspektivy sotsial'no-ekonomicheskogo razvitiya i rol' nauki: akademicheskiy diskurs". [Internet]. [cited 2019 May 25]. Available from: <http://www.veorus.ru/maef/about/> (In Russ.)].
3. Ожегов С.И., Шведова Н.Ю. Толковый словарь русского языка. – М.: ОНИКС, 2012. – 1376 с. [Ozhegov SI, Shvedova NYu. Tolkovyy slovar' russkogo yazyka. Moscow: ONIKS, 2012. 1376 p. (In Russ.)].
4. Зверев В.С., Зверев В.С., Унтура Г.А. и др. Толковый словарь «Инновационная деятельность»: термины инновационного менеджмента и смежных областей (от А до Я). – Новосибирск: ИЭОПП СО РАН, 2010. – 183 с. [Zverev VS, Zverev VS, Untura GA, et al. Tolkovyy slovar' "Innovatsionnaya deyatelnost": terminy innovatsionnogo menedzhmenta i smezhnykh oblastey (ot A do Ya). Novosibirsk: IEOPP SO RAN, 2010. 183 p. (In Russ.)].
5. Официальный сайт Федеральной службы государственной статистики. Доступно по: <http://www.gks.ru/>. Ссылка активна на 10.04.2019 г. [Ofitsial'nyy sayt Federal'noy sluzhby gosudarstvennoy statistiki. Available from: <http://www.gks.ru/> (In Russ.) Accessed April, 10, 2019].
6. 20 % компаний, котирующихся в NASDAQ, – израильские. Доступно по: <https://shofar7.com/2015/05/17/20-компаний-котирующихся-в-nasdaq-израильс/> Ссылка активна на 10.04.2019 г. [20% kompaniy, kotiruyushchikhsya v NASDAQ, – izrail'skiye. [Internet]. [cited 2019 April 10]. Available from: <https://shofar7.com/2015/05/17/20-компаний-котирующихся-в-nasdaq-израильс/> (In Russ.)].
7. На старт... внимание... up! Hi-tech в Израиле: индустрия стартапов. Доступно по: <http://itbusinessweek.com/startup-industry-in-israel/>. Ссылка активна на 10.04.2019 г. [Na start... vnimaniye... up! Hi-tech v Izraile: industriya startupov. [Internet]. [cited 2019 April 10]. Available from: <http://itbusinessweek.com/startup-industry-in-israel/>. (In Russ.)].
8. Рекомендации по разработке программ инновационного развития акционерных обществ с государственным участием, государственных корпораций и федеральных государственных унитарных предприятий. Утв. решением Правительственной комиссии по высоким технологиям и инновациям от 3 августа

2010 г., протокол № 4 Доступно по: https://itk-mdl.asutk.ru/upload/doc/rekomend_po_razrabotke_pro.pdf. Ссылка активна на 10.04.2019 г. [Rekomendatsii po razrabotke programm innovatsionnogo razvitiya aktsionnykh obshchestv s gosudarstvennym uchastiyem, gosudarstvennykh korporatsiy i federal'nykh gosudarstvennykh unitarnykh predpriyatiy. Utv. resheniyem Pravitel'stvennoy komissii po vysokim tekhnologiyam i innovatsiyam ot 3 avgusta 2010 g., protokol № 4. [Internet]. [cited 2019 April 10]. Available from: https://itk-mdl.asutk.ru/upload/doc/rekomend_po_razrabotke_pro.pdf (In Russ.)].

Сведения об авторе:

Соколова Яна Викторовна, кандидат экономических наук, MBA;
eLibrary SPIN: 2817-4647; ORCID 0000-0002-1230-1893;
E-mail: nozpgups@gmail.com

Information about the author:

Iana V. Sokolova, Candidate of Economic Science (PhD), MBA;
eLibrary SPIN: 2817-4647; ORCID 0000-0002-1230-1893;
E-mail: nozpgups@gmail.com

To cite this article:

Sokolova IaV. On Assessment of Influence of Innovation Activities Results on the National Economy. *Transportation Systems and Technology*. 2019;5(2):118-129. doi: 10.17816/transsyst201952118-129

Цитировать:

Соколова Я.В. Об оценке влияния результатов инновационной деятельности на национальную экономику // Транспортные системы и технологии. – 2019. – Т. 5. – № 2. – С. 118–129. doi: 10.17816/transsyst201952118-129