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НАУКОЕМКОСТЬ КАК ФАКТОР РАЗВИТИЯ КОНКУРЕНТНЫХ ПРЕИМУЩЕСТВ СОВРЕМЕННОГО ПРЕДПРИЯТИЯ

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Инновационная деятельность современного предприятия тесно связана с понятием наукоемкости. В силу неоднозначности трактования этого термина упускается аспект влияния наукоёмкости на конкурентоспособность предприятия. Промышленное предприятие, обладающее инновационной составляющей, очевидно имеет конкурентное преимущество. Проведенные в исследовании анализ и систематизация имеющихся критериев наукоёмкости позволяет выявить сильные и слабые стороны предприятия, работа с которыми позволит повысить уровень конкурентоспособности, наукоемкости предприятия и эффективность его деятельности

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RESEARCH INTENSITY AS A FACTOR OF THE DEVELOPMENT OF THE COMPETITIVE ADVANTAGES OF A MODERN COMPANY

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The innovative activity of a modern enterprise closely related to the concept of research intensity. The aspect of the influence of research intensity on the competitiveness of an enterprise missed due to the ambiguity of the interpretation of this term. An industrial enterprise with an innovative component obviously has a competitive advantage. The analysis and systematization of the existing research intensity criteria carried out in the study makes it possible to identify the strengths and weaknesses of the enterprise, working with which will increase the level of competitiveness, research intensity of the enterprise and the efficiency of its activities.

Ключевые слова: ИННОВАЦИОННАЯ АКТИВНОСТЬ, ВЫСОКИЕ ТЕХНОЛОГИИ, ЧЕЛОВЕЧЕСКИЙ КАПИТАЛ, ГРАЖДАНСКОЕ ПРОИЗВОДСТВО

Keywords: DIVERSIFICATION, HIGH TECHNOLOGIES, HUMAN CAPITAL, CIVIL PRODUCTION

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Introduction

In modern conditions of ever-increasing competition between producers of goods and services, an enterprise aimed at success must engage in innovative activities. Innovative projects implemented at the enterprise can aim at both improving and modernizing existing technologies or products, and new technological solutions. The introduction of new scientific results increases the value added of products, which has a positive effect on the economy, increases the research intensity of the enterprise, and directly affects the development of the competitiveness of the enterprise and its products. With an increase in the level of manufacturability, production times reducing, indicators of material consumption, labor intensity and labor productivity changing, which increases the ability of the enterprise to compete both in the domestic and global markets.

The relevance of the creation and operation of enterprises engaged in R&D, improving the manufacturability of the production process, and promoting science-intensive products is beyond doubt, since this allows overcoming the limited resources to some extent. In addition, constant technological inflation requires manufacturers to improve their production process, technologies and products.

In the new century, science, knowledge and information are becoming the basis and a factor of production, and a full-fledged commodity. The intellectual component of goods often comes to the fore and is valued higher than the physical. The accumulation of intellectual capital occurs in the process of R&D, so we can conclude that it is concentrated in knowledge-intensive industries. Consequently, with the growth of the intellectual component, the manufactured products improve and they will have competitive advantages. Logically concluded that an increase in the level of research intensity will have a positive impact on the competitiveness of science-intensive products, but a number of factors may appear that will hinder this process.

Literature review

In the scientific literature, we can find a large number of definitions and characteristics of both science-intensive products and science-intensive production. These definitions boil down to the fact that economic entities with high absolute and relative (in relation to total production costs) R&D costs are considered science-intensive [2, 4].

In a general sense, research intensity defined as the degree of contribution of the scientific and technological factor to the creation of the final product. This concept establishes the relationship between the scientific and technological level of production, manufactured products and the costs of R&D [14].

Research intensity often identified with the concept of high technology. However, this is not entirely correct, since high spending on science found in not only high-tech industries, and research intensity can be only one of the criteria for an industry or enterprise to belong to the high-tech category. Rather let us considered research intensity as a factor in assessing the innovative activity of an enterprise. Research intensity considered as an indicator of the scientific and technical reserve, which used to compare the level of innovativeness of enterprises [18].

The very concept of research intensity arose in the process of technical and technological development and closely related to innovation activity. The term "research intensity" appeared in 1958 in a study of American scientist E. Hoffmeyer about the analysis of foreign trade, during which he found that the United States has a competitive advantage in knowledge-intensive industries. This became the starting point for considering science and technology as the driving force behind the economic development of both the country as a whole and individual enterprises in particular.

The study of various aspects of research intensity and production and products, the derivation of indicators of research intensity, and the classification of industries on this basis engaged by such Russian scientists, as Abrashkin M.S., Batkovsky A.M., Varshavsky A.E., Klochkov V.V., Konoplitsky V.A., Kulvets P.A., Lakhtin G.A., Filina A.I., Khrustalev E.Y., Khrustalev O.E.

Such scientists deal with the issues of determining and evaluating research intensity indicators as Abrashkin M.S., Garafieva G.I., Morgunov Y.A. These authors have derived a number of indicators that assess the degree of research intensity of enterprises: industry, personnel, product, technology, financial, and others. However, until now, the most used method is the rate of return method of determining the indicator of research intensity, and the assessment methods needs clarification, since the issues of standardization of criteria for ranking industries and individual enterprises in terms of their level of research intensity have not yet been resolved.

Fragmentation, inconsistency and low approbation of existing approaches to the definition of the concept of research intensity, methods for estimating research intensity, patterns of research intensity and industries, enterprises and products makes it difficult to apply these approaches and methods in practice.

Difficulties in defining the concept make it complicate to identify research intensity at any level, and, accordingly, assess its impact on the competitiveness indicator.

Methodology and most important obtained results

Analysis of the theoretical provisions of Russian and foreign studies in the field of research intensity assessment, synthesis and interpretation of the results obtained constituted the theoretical and methodological basis of this study [7].

An analysis of the literature showed that two approaches to determining research intensity and the share of R&D costs are in demand: industry and product. It is often customary to consider an enterprise as research-intensive if it is part of a research-intensive industry. This approach is based on the indicator of the share of R&D expenses in the cost of science-intensive products significantly exceeds the value of such an indicator in other industries. A high level of spending on R&D considered as the main sign of research intensity of an industry or an individual enterprise, the key to their continuous and intensive innovation activity.

In the scientific literature, there is a definition of research-intensive industry as an industry of the economy that produces products, works and services using the latest developments [16].

The economic literature also identifies a number of other features that distinguish the research-intensive industry from others [12, 15, 21]:

1) high growth rate compared to other industries;

2) significant share of value added in the final product;

3) high wages compared to other industries;

4) large export volumes;

5) innovative potential.

Usually there are two approaches to the definition of research intensity: industry and product. Both based on the share of R&D spending. It is obvious that the industry approach used to determine the research-intensive industry, and the product approach used to determine the manufactured products.

The industry approach has two significant drawbacks: the lack of a unified methodology according to which industry classified as research-intensive industry, and the identification of research intensity of the industry and its enterprises. The list of research-intensive industries cannot strictly defined, since research intensity can be a characteristic of different industries and areas in different periods. For example, at the stage of development and implementation of a new technology, the indicator of research intensity will be high, and at the stage of bringing serial products to the market and expanding the scale of production, R&D costs will decrease, and, consequently, research intensity. The identification of research-intensive industry and its enterprises is unfair, since an enterprise that is part of the research-intensive industry does not always incur large R&D expenses. Conversely, an enterprise that not related to the research-intensive industry recognized as research-intensive in terms of R&D costs.

There is also no strict indicator of research intensity in the product approach. Products considered as research-intensive if the share of R&D costs is not lower than the criterion indicator.

There are also other research intensity criteria based on the calculation of the coefficients. The formulas for calculating these coefficients, their description and shortcomings given in Table 1.

Table 1. The coefficient of research intensity

Coefficient	Formula	Meaning	Disadvantages
The coefficient of research intensity of labor (personnel approach)	$K_{KIL} = \frac{S_{KI}(t)}{S_T(t)}$	The share of highly qualified personnel in the total number of personnel	There is no accounting for the qualitative parameters of personnel, it is difficult to determine the degree of participation of employees in the production of research intensity products
The coefficient of research intensity of production (cost approach)	$K_{KIM} = \frac{C_{R\&D}(t)}{V_{GO}(t)}$	R&D costs	Difficulty in obtaining accurate information on R&D costs

The coefficient of research intensity of products (product approach)	$K_{KIP} = \frac{C_{KI}(t)}{C_T(t)}$	The ratio of research-intensive products to output	Difficulties in classifying products as research-intensive products
Manufacturability factor (technological approach)	$K_т = \frac{C_{TA}(t)}{V_{GO}(t)}$	Use and development of advanced technologies	Not applicable to all enterprises, a full production cycle is required
Cost ratio of research intensity (financial approach)	$K_{KIC} = \frac{C_{R\&D}(t)}{C_T(t)}$	The ratio of R&D costs to total costs for the production of products (works, services)	Difficulty in obtaining accurate information on R&D costs

Source: compiled by the author based on the works [1, 9]

Where: S_{KI} – number of personnel employed in R&D; S_T – total headcount; $C_{R\&D}$ – R&D spending; V_{GO} – gross output; C_{KI} – costs of producing research-intensive products; C_T – total cost of production; C_{TA} – enterprise costs for technological activities.

Individually, each coefficient is undescriptive. The coefficients of research intensity complement each other and, in combination, are able fully characterize research intensity. Domestic authors have developed a unified comprehensive approach to assessing research intensity based on these coefficients. There are also several additional signs that the enterprise belongs to the research-intensive category: the presence of scientific schools, teams of professional workers, special R&D units at the enterprise.

Thus, research intensity is a rather specific category, since largely it acts as a qualitative characteristic, which complicates its quantitative assessment. In addition, in the course of scientific and technological development, the rate of updating and implementation of technologies, the dissemination of information is constantly increasing, which also affects the average value of the research intensity indicator [20].

However, an increase of the research intensity indicator does not always mean an increase in the competitiveness indicator. A product can be research-intensive, but at the same time have low competitiveness. In such conditions,

research-intensive enterprises need to regularly create and strengthen the competitive advantages of their products.

In this case, the main development factor will be R&D, as they will attract investment, improve technological processes. This provides a continuous correlation between production, technology and science. In addition, the innovative potential that arises in the process of R&D is the main incentive for the development of research intensity of any enterprise, since the commercialization of innovations has economic prospects. There is an economic effect from the introduction of innovation. It is precisely that this high income that investors, who invest their capital by repurchasing shares from developing companies, aimed at. This gives companies the opportunity to increase their R&D spending. However, scientists note that in Russia, innovation processes face obstacles in the economic, political and legal nature [8].

In addition, there are problems with the evaluation of innovative projects. The objectives of the assessment are minimization of risks, search for the target audience, compliance with the development strategy, analysis of the availability of resources. To be effective, research-intensive enterprise must have the necessary equipment, financial and human resources, and information support [6]. Moreover, the rapid growth of the research-intensive sector escalate the problem of lack of personnel, resources and information. Therefore, it is important to calculate the research intensity coefficients presented in Table 1 in order to understand which indicator needs to be “pulled up” for effective work.

Discussion

The pace of technological soaring inflation, the change in the scientific and technological level of a number of industries, the transition to a new technological order requires the development and effective functioning of an innovation system. Development largely determined by the amount of consumption and production by R&D enterprises, which require constant funding. The innovative activity of any country based on sufficient financial

support [19]. Each country has its own industry-specific innovation development; however, the predominance of research-intensive industry is a sign of technologically advanced countries [10].

Usually, the development of research intensive and high-tech industries supported by the government. One of the most important macroeconomic indicators of the effectiveness of R&D financing, reflected in the "Strategy for Scientific and Technological Development of the Russian Federation" is the coefficient of total research intensity and GDP (R&D costs as a percentage of GDP). Considered that if this coefficient exceeds 3%, then the country has a favorable innovation climate that promotes the development of a research-intensive industry [5]. At the end of 2019, according to the OECD, this threshold exceeded by eight countries: Japan, Germany, USA, Denmark, Austria, and Sweden. China is approaching this level - 2.2%, the value of this indicator in Russia is constantly at the level of 1%. One of the goals of the Science and Technology Development Strategy is to achieve a research intensity ratio and GDP of 2% by 2035. However, R&D spending in Russia relatively low, compared to the leading countries (see Figure 1).

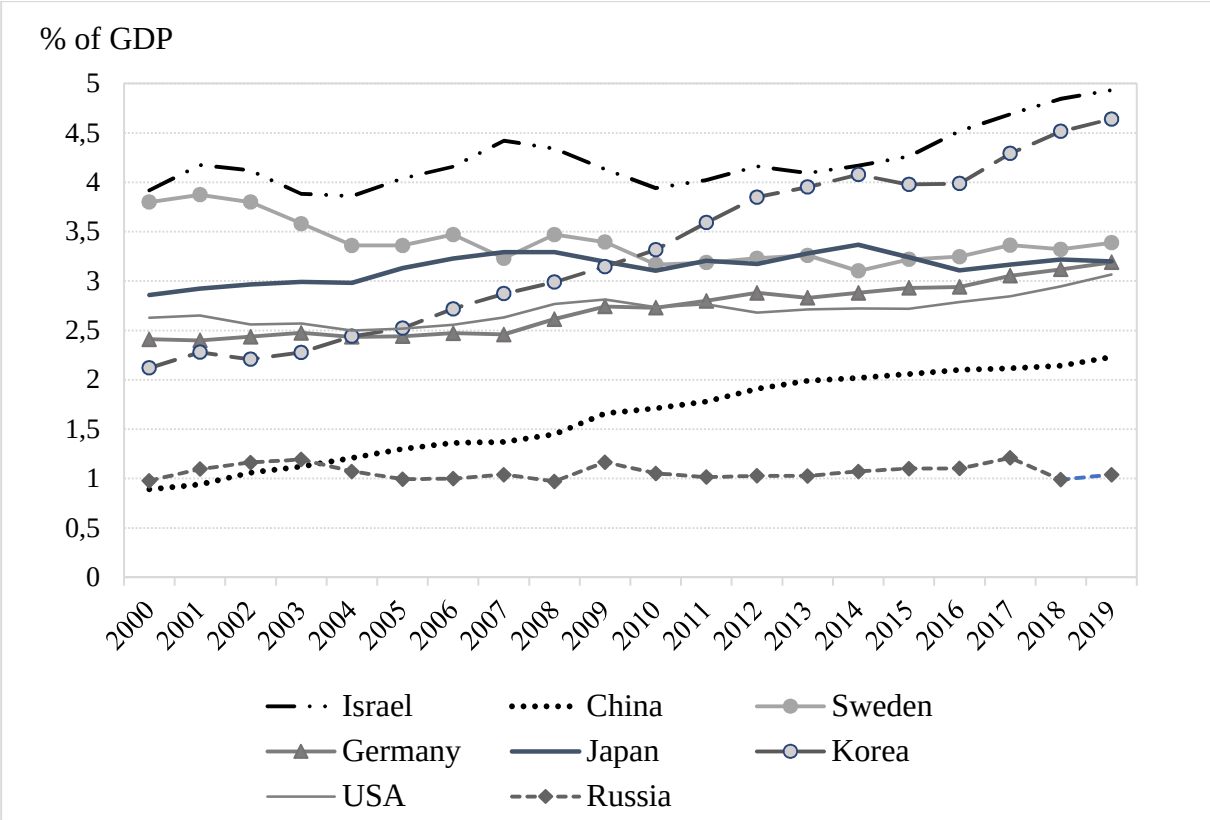

Figure 1. Gross domestic spending on R&D
Source: [17]

R&D spending is a defining feature of research intensity. Without constant research, economic development both at the level of enterprises, industries, and on a global scale is impossible. Research-intensive technologies penetrate into all industries of production and services, into the daily life of people [13]. On the one hand, it increases the consumer properties of a product or service, respectively, their competitiveness, which improves the quality of consumption [3]. Competitive products ensure the competitiveness of the enterprise, and competitive enterprises in industries means that the industry is competitive. On the other hand, the higher the product quality, the higher the consumer's requirements for product quality and sales and after-sales service become. Often, research-intensive products produced by “generations”. In order to maintain a position in the research-intensive market an enterprise needs to predict consumer properties to stay afloat. This also has a positive effect on competitiveness.

Bringing new product properties or new products to the market is always associated with risks and with search for a target audience. Before entering the market, it is necessary to conduct not only an analysis of risks, but also of resources, the life cycle of the product, whether this will be a step towards fulfillment of the company's strategic goals and whether the output of products will increase the company's competitiveness and strengthen its position.

Constant research is a high cost, which is subsequently included in the cost of products and constitutes a significant part of the price. In this regard, the pricing of research-intensive products raises many questions. The main one is how to set a “competitive” price so that the consumer is able to buy this product, and the company not only covers the costs, but also makes a profit for further development.

The management of research-intensive enterprises cause difficulties, as the management system becomes more complicated: the range of components and materials increases, technologies and equipment become more complex, complex relationships with other firms, competitors, and suppliers formed. It is necessary continuously monitor the state of the external and internal environment [11].

Research-intensive technologies are attractive to small and medium enterprises because they can enable them to grow rapidly. The growth of profits of enterprises producing research-intensive products occurs due to the excess of prices over marginal costs and the receipt of technological rent from a temporary monopoly on a new technology. In addition, it is possible to obtain income from the sale of technology. In addition, investors are attracted to fast-growing companies, and they buy back their shares, thus investing in further R&D. Development of small and medium-sized enterprises plays an important role in the economy of any country, forming its basis.

Conclusion

Research-intensive technologies, products, productions and industries are currently acting as the main driver of the economy at all levels: from a single firm to a global scale. Many types of economic activity that classified as high-tech abroad, in Russia - as medium-tech.

Besides, in Russia, the development of technologies of the sixth technological wave carried out in conditions of low demand for domestic research-intensive products, which do not always have a high level of competitiveness.

Often, in order to increase competitiveness, a company decides to buy a technology, under the illusion of being able to enter the global market quickly. However, for the effective development of a new technology, material and human resources needed, especially highly qualified personnel needed to adapt that technology. Lack of staff qualifications can lead to inefficient usage of limited resources. The larger the research-intensive sector becomes, the more acute the staffing problem becomes. The solution to this problem lies in the field of higher education.

In countries with a high level of innovative activity, there is an effective interaction of four spheres: business, government, science and education. Without the last component, technology development is impossible. In fact, universities produce highly qualified scientists, who then conduct R&D, and thus act as a source of technology. Consequently, without highly qualified personnel it is difficult to count on high quality, competitiveness and research intensity of products. The development of science is one of the most important engines of the socio-economic growth of any country.

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REFERENCES

1. Abrashkin M.S. Metodika ocenki vysokotekhnologichnyh predpriyatij raketno-kosmicheskoj tekhniki // Organizator proizvodstva. 2018. № 26(3). S. 74-84.

2. Abrashkin M.S. Naukoemkost' i innovacionnoe razvitie mashinostroitel'nyh predpriyatij // Vestnik AGTU. Seriya: Ekonomika. 2018. № 4. S. 107-115.

3. Avdulov A.N., Kul'kin A.M. Paradigma sovremennogo nauchno-tekhnicheskogo razvitiya. – M: INION RAN, 2010. – 304 s.

4. Akimkina D.A., Khrustalev E.Yu. Tekhnologicheskij broker kak instrument povyshenie naukoemkosti promyshlennosti // Kontrolling. 2021. № 2 (80). S. 62-69.

5. Afanas'eva G.N., Kostin R.S. Rynok vysokotekhnologichnyh otraslej: rossijskij i mezhdunarodnyj // V sbornike: Innovacionnoe razvitie Rossii: problemy i perspektivy. IV Mezhdunarodnaya nauchno-prakticheskaya konferenciya. – Penza: PGAU, 2015. S. 8-12.

6. Balhanova D.K. Stimuly i riski innovacionnoj ekonomiki // Normirovanie i oplata truda v promyshlennosti. 2018. № 3. S. 53-57.

7. Baranovskaya T.P., Simonyan R.G., Vostroknutov A.E. Teoriya sistem i sistemnyj analiz (funkcional'no-strukturnoe modelirovanie). – Krasnodar: KubGAU, 2011. – 230 s.

8. Barinova N.V. Kommercializaciya innovacij v Rossii i puti ee preodoleniya na sovremennom etape razvitiya ekonomiki // Vestnik Rossijskogo ekonomicheskogo universiteta im. G.V. Plekhanova. 2020. Tom 17. №. 2(110). S. 32-41.

9. Garafieva G.I. Pokazateli naukoemkosti neftekhimicheskih predpriyatij Privolzhskogo federal'nogo okruga // Vestnik Kazanskogo tekhnologicheskogo universiteta. 2012. Tom 15. № 4. S. 141-144.

10. Il'ina I.E., Zharova E.N. Naukoemkost' predprinimatel'skogo sektora v Rossii: analiz i predlozheniya po razvitiyu // Regionovedenie. 2020. Tom 28. № 3 (112). S. 414-448.

11. Kadeeva E.N., Kadeev Z.R. Metodologicheskie aspekty formirovaniya sistemy pokazatelej NIOKR nauchnogo predpriyatiya v ramkah koncepcii kontrollinga // Upravlenie ustojchivym razvitiem. 2018. № 4. S. 29-32.

12. Kalmykova V.V., Shcherbakova O.R. Ekonomicheskaya bezopasnost' naukoemkih predpriyatij // Simvol nauki: mezhdunarodnyj nauchnyj zhurnal. 2020. № 10. S. 55-59.

13. Larin S.N., Kuropatkina L.V., Khrustalev E.Yu. Innovacionnye naukoemkie tekhnologii resursosberezheniya kak mekhanizm progressivnogo social'no-ekonomicheskogo razvitiya // Politematicheskij setevoj elektronnyj nauchnyj zhurnal KubGAU. 2021. № 169 (05). S. 289-302.

14. Larin S.N., Khrustalev O.E. Model' konkurencii naukoemkih proizvodstvennyh kompleksov pri razrabotke innovacionnoj produkcii // Ekonomika i biznes: teoriya i praktika. 2021. № 6-1. S. 140-145.

15. Morgunov YU.A., Saushkin B.P., SHandrov B.V. Naukoemkost' mashinostroitel'nogo proizvodstva i ego elementy // Naukoemkie tekhnologii v mashinostroenii. 2019. № 6. S. 37-44.

16. Novickaya V. D. Marketingovaya logistika v prodvizhenii vysokotekhnologichnoj produkcii // V sbornike: Logistika – evrazijskij most. Materialy HI mezhdunarodnoj nauchno-prakticheskoj konferencii. – Krasnoyarsk: KGAU, 2016. S. 189-193.

17. OESR. Valovye vnutrennie raskhody na NIOKR. [Onlajnovyj resurs]: https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm.

18. Potekha V.L., Pahomova I.A. Naukoemkost' produkcii kak faktor povysheniya konkurentosposobnosti promyshlennyh predpriyatij Respubliki Belarus' // Konkurentosposobnost' predpriyatij i regionov v global'noj ekonomike: sbornik nauchnyh statej. CH. 2 / Uchrezhdenie obrazovaniya Grodnenskij gosudarstvennyj universitet imeni YAnki Kupaly. – Grodno: GrGU, 2009. S. 89-94.

19. Khrustalev O.E., Larin S.N., Khrustalev E.Yu. Kreditovanie naukoemkih proizvodstv s pomoshch'yu innovacionnyh progressivnyh tekhnologij // Ekonomika i predprinimatel'stvo. 2021. № 8. S. 654-658.

20. Chernegov N.YU. Strategiya razvitiya vysokotekhnologichnyh predpriyatij po proizvodstvu vysokotekhnologichnoj produkcii // Vestnik sovremennyh issledovanij. 2018. № 10.8. S. 217-220.

21. Evgeny Yu. Khrustalev. Valeriy V. Iosifov. Alexey N. Omelchenko. Managing Technological Change of the Russian Economy Based on the Principle of Technological Homogeneity // IFAC-PapersOnLine. 2021. Volume 54. Issue 13. Pp. 523-527.

СПИСОК ЛИТЕРАТУРЫ

1. Абрашкин М.С. Методика оценки высокотехнологичных предприятий ракетно-космической техники // Организатор производства. 2018. № 26(3). С. 74-84.

2. Абрашкин М.С. Наукоемкость и инновационное развитие машиностроительных предприятий // Вестник АГТУ. Серия: Экономика. 2018. № 4. С. 107-115.

3. Авдулов А.Н., Кулькин А.М. Парадигма современного научно-технического развития. – М: ИНИОН РАН, 2010. – 304 с.

4. Акимкина Д.А., Хрусталев Е.Ю. Технологический брокер как инструмент повышение наукоемкости промышленности // Контроллинг. 2021. № 2 (80). С. 62-69.

5. Афанасьева Г.Н., Костин Р.С. Рынок высокотехнологичных отраслей: российский и международный // В сборнике: Инновационное развитие России: проблемы и перспективы. IV Международная научно-практическая конференция. – Пенза: ПГАУ, 2015. С. 8-12.

6. Балханова Д.К. Стимулы и риски инновационной экономики // Нормирование и оплата труда в промышленности. 2018. № 3. С. 53-57.

7. Барановская Т.П., Симонян Р.Г., Востроknутов А.Е. Теория систем и системный анализ (функционально-структурное моделирование). – Краснодар: КубГАУ, 2011. – 230 с.

8. Баринова Н.В. Коммерциализация инноваций в России и пути ее преодоления на современном этапе развития экономики // Вестник Российского экономического университета им. Г.В. Плеханова. 2020. Том 17. №. 2(110). С. 32-41.

9. Гарафиева Г.И. Показатели наукоемкости нефтехимических предприятий Приволжского федерального округа // Вестник Казанского технологического университета. 2012. Том 15. № 4. С. 141-144.

10. Ильина И.Е., Жарова Е.Н. Наукоемкость предпринимательского сектора в России: анализ и предложения по развитию // Регионоведение. 2020. Том 28. № 3 (112). С. 414-448.

11. Кадеева Е.Н., Кадеев З.Р. Методологические аспекты формирования системы показателей НИОКР научного предприятия в рамках концепции контроллинга // Управление устойчивым развитием. 2018. № 4. С. 29-32.

12. Калмыкова В.В., Щербакова О.Р. Экономическая безопасность наукоемких предприятий // Символ науки: международный научный журнал. 2020. № 10. С. 55-59.

13. Ларин С.Н., Куропаткина Л.В., Хрусталев Е.Ю. Инновационные наукоемкие технологии ресурсосбережения как механизм прогрессивного социально-

экономического развития // Политематический сетевой электронный научный журнал КубГАУ. 2021. № 169 (05). С. 289-302.

14. Ларин С.Н., Хрусталев О.Е. Модель конкуренции наукоемких производственных комплексов при разработке инновационной продукции // Экономика и бизнес: теория и практика. 2021. № 6-1. С. 140-145.

15. Моргунов Ю.А., Саушкин Б.П., Шандров Б.В. Наукоемкость машиностроительного производства и его элементы // Наукоемкие технологии в машиностроении. 2019. № 6. С. 37-44.

16. Новицкая В. Д. Маркетинговая логистика в продвижении высокотехнологичной продукции // В сборнике: Логистика – евразийский мост. Материалы XI международной научно-практической конференции. – Красноярск: КГАУ, 2016. С. 189-193.

17. ОЭСР. Валовые внутренние расходы на НИОКР. [Онлайновый ресурс]: https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm.

18. Потеха В.Л., Пахомова И.А. Наукоемкость продукции как фактор повышения конкурентоспособности промышленных предприятий Республики Беларусь // Конкурентоспособность предприятий и регионов в глобальной экономике: сборник научных статей. Ч. 2 / Учреждение образования Гродненский государственный университет имени Янки Купалы. – Гродно: ГрГУ, 2009. С. 89-94.

19. Хрусталев О.Е., Ларин С.Н., Хрусталев Е.Ю. Кредитование наукоемких производств с помощью инновационных прогрессивных технологий // Экономика и предпринимательство. 2021. № 8. С. 654-658.

20. Чернегов Н.Ю. Стратегия развития высокотехнологичных предприятий по производству высокотехнологичной продукции // Вестник современных исследований. 2018. № 10.8. С. 217-220.

21. Evgeny Yu. Khrustalev. Valeriy V. Iosifov. Alexey N. Omelchenko. Managing Technological Change of the Russian Economy Based on the Principle of Technological Homogeneity // IFAC-PapersOnLine. 2021. Volume 54. Issue 13. Pp. 523-527.