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"Patent Factory" as a Factor in the Development of Innovative Activity of Society

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Abstract. Despite the growing external challenges, the Russian economy has a great potential for its development. Restrictions on economic cooperation ("sanctions") introduced by a number of countries create many barriers to functioning of Russian entities, especially those with interests in foreign markets. However, there are also positive effects associated with the need to quickly adapt the business in the domestic market and activate the existing innovative potential to accelerate a pace of development and fill the vacated business niches. Innovative entrepreneurship is becoming more widespread in the development of the quadruple helix model with emerging a new actor in the form of "society". The target of this study is to develop the author's model of the "patent factory" as a new reference point for diffusing innovations and disclosing the existing potential in society. The subject of the study is the organizational and economic relations that arise in the process of strengthening the ability of society to generate innovations. The results of the study are based on the implementation of empirical and dialectical methods of scientific knowledge and other scientific methods. The methodological toolkit covers such information processing methods as a literature review using the RSCI and Scopus research databases, analysis of the dynamics of statistical indicators, as well as a method for comparing patent applications and granted patents for inventions in 2017–2021 periods among individuals and legal entities. The authors propose a model for interaction between "young" and "serial"" inventors to form and develop the innovative potential of society which will contribute to the welfare and a sustainable development of all participants in the innovative model. As a result, we should expect a more active influx of progressive innovative ideas and developments implemented in this model which would ensure advancing the level of innovative activity in society and contribute to the socio-economic development of the country.

Keywords: innovation activity, quadruple helix, society, individual inventor, patent activity, patent factory.

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«Фабрика патентов» как фактор развития инновационной активности в обществе

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Аннотация. Несмотря на возрастающие внешние вызовы, российская экономика имеет большой потенциал для своего развития. Вводимые рядом стран ограничения на экономическое сотрудничество («санкции») создают множество барьеров для функционирования российских субъектов, особенно имеющих интересы на внешних рынках. Тем не менее имеются и положительные эффекты, связанные с необходимостью быстрой адаптации бизнеса на внутреннем рынке и активизации имеющегося инновационного потенциала для ускорения темпов развития и заполнения освободившихся бизнес-ниш. Все большее распространение получает инновационное предпринимательство в развитии модели четверной спирали с появлением нового актора в виде «общества». Цель настоящего исследования состоит в разработке авторской модели «фабрики патентов» как новой реперной точки для диффузии инноваций и раскрытия имеющегося потенциала в обществе. Предметом исследования выступают организационно-экономические отношения, возникающие в процессе усиления способности общества генерировать инновации. Результаты исследования базируются на реализации эмпирических и диалектических методов научного познания и других научных методах. Методический инструментарий охватывает такие методы обработки информации, как обзор литературы с использованием исследовательских баз данных РИНЦ и Scopus, анализ динамики статистических показателей, а также метод сравнения заявок на патенты и выданных патентов на изобретения за 2017–2021 гг. среди физических и юридических лиц. Авторами предложена модель взаимодействия между «молодыми» и «серийными» изобретателями с целью формирования и развития инновационного потенциала общества, что будет способствовать повышению благосостояния и устойчивого развития всех участников в инновационной модели. В результате следует ожидать более быстрого притока прогрессивных инновационных идей и разработок, реализуемых в данной модели, что обеспечит повышение уровня инновационной активности общества и будет способствовать социально-экономическому развитию страны.

Ключевые слова: инновационная деятельность, четверная спираль, общество, индивидуальный изобретатель, патентная активность, фабрика патентов.

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Introduction

To date, there are several well-established ideas about models of innovation activity (Sysoeva, 2019). Many authors single out a linear model to be known as a triple helix (Etzkowitz & Leydesdorff, 1995) consisting of three actors – government, business, and science. Subsequently, some researchers (Carayannis & Campbell, 2009) came to the conclusion that this model should be supplemented by the fourth element – society. Later, the concept of a five-term model has been developed to consider a humanistic orientation based on a knowledge democracy, sustainability and the principles of freedom (Carayannis & Campbell, 2011; Carayannis et al., 2012).

It is worth mentioning that essence and functions of such actors as science, business and the state are quite unambiguously disclosed in the legal documentation[1]. In difference, the "society" actor is characterized by a whole range of areas to be distinguished as media, culture, creative industries, and art (Carayannis & Grigoroudis, 2016), whose role and importance remain underestimated (Linton, 2018). As I. V. Razinkina (Razinkina, 2022) noted, the role of society is revealed in forming and maintaining the values of knowledge, the culture of knowledge and the popularization of innovations. However, a modern society is more integrated into the innovation process, and can be revealed in such functions as:

1. Consumption of innovative products and employing new technologies by society. In this process, there is a problem associated with the perception of innovations by society. Some parts of society perceive them positively or neutrally, while many experience difficulties while adopting new technological devices; the latter issue is particularly characteristic for the older generation. However, the ability to master innovations is the key point to their accelerated dissemination and adaptation to new environment as noted in study by A. Pishnyak and N. Khalina (Pishnyak, Khalina, 2021). 2. Generation of innovative ideas. This function of society is most revealing within framework of open innovation model where an interaction while product developing increases the accuracy for market research and promotes the interest of the target audience to the company as noted by some authors (Carayannis & Grigoroudis, 2012; Kiseleva et al., 2022). 3. Creation of innovative technologies. This function is revealed through the creation and patenting by individuals the results of intellectual activities (RIA). Despite the well-established opinion that the scientific sector (universities and research institutes) and business play the leading role in innovative development, the initiatives of individuals in this area occupy a significant share. A necessity to develop the creative potential of society is confirmed by changes in a domestic legislation. From June of 2023, it is allowed in Russia to register trademarks for individuals and the self-employed persons that are expected to contribute into intensifying a promotion of goods and services on the market.

Herein, we propose the model of "Patent Factory" which allows one identifying the most progressive ideas and activating the process of dissemination of innovations generated by individual inventors. We suggest a typology

[1] Federal Law No. 127-FZ dated August 23, 1996 (as amended on 10/07/2022) "On Science and State Scientific and Technical Policy" (as amended and supplemented, entered into force on 12/26/2022). URL: https://www.consultant.ru/law/podborki/innovacionnaya_deyatelnost/ (accessed 04 April 2023).

for evaluating an efficiency of implemented innovations in dependence on the final result. The further research is considered as a deeper study of issues related to the development and practical application of this model in order to enhance the innovative potential of individual inventors, analysis of the effects and increment to the socio-economic development in various domestic regions and the country as a whole. In following studies, we suggest proposing (1) a mechanism for adapting the model in dependence on the level of patent activity in federal regions and (2) parameters to achieve the maximum effect of the model under suggestion.

Analysis of innovative activity of individual inventors in Russia and abroad

The specificity of the society as an actor, to be referred, in the context of the study, to individuals engaged in inventive activities or individual inventors, to participate in innovative models is characterized as follows:

– a low attractiveness for investing at the market;

– a lack of large amount of financial investments, flagship equipment and developed infrastructure;

– the actual lack of state support in the field of innovative developments;

– application-oriented activity to get primarily a fast profit;

– active introduction of innovations into personal production without waiting for the issuance of a patent or carrying out activities without a legislative protection of the innovation.

We analyze a patent activity among individuals and legal entities in the context of filed and granted patents for the period of 2017–2021 years within federal regions of Russia. The data are shown in Tables 1, 2.

Accounting for these data, the following conclusions can be derived on the patent activity of individuals:

1) There is a trend in the reduction of applications and granted patents for inventions which can be attributed to the limitation of the possibility of duty-free patenting because the applicant must demonstrate since 2014 achiev-

Table 1. Distribution of applicants in 2017–2021 years by Russian applicants for inventions within federal regions of Russia*

Year	Invention applications	Central Federal Region	Northwestern Federal Region	Southern Federal Region	North Caucasian Federal Region	Volga Federal Region	Ural Federal Region	Siberian Federal Region	Far Eastern Federal Region	Share, (%)
2017	Legal entity	5868	1465	988	350	2426	724	1406	370	59.5
	Individual	5662	691	555	288	1173	304	406	89	49.5
2018	Legal entity	6212	1623	1032	346	2378	706	1425	371	69.5
	Individual	7620	582	578	82	1059	297	491	85	39.5
2019	Legal entity	6323	1786	1021	319	2410	700	1466	379	61.5
	Individual	4457	1902	481	87	1057	317	468	114	38.5
2020	Legal entity	6357	1717	876	345	2369	742	1420	368	61.7
	Individual	3779	3414	441	76	1002	265	414	114	38.3
2021	Legal entity	6303	1628	927	338	2529	817	1505	362	73.8
	Individual	2385	552	459	94	830	297	391	90	26.2

Source: compiled according to Federal Institute of Industrial Property (Russia)

*Annual official publication of the Federal Service for Intellectual Property (Rospatent) 2017–2021

Table 2. Distribution of issued patents for inventions in 2017–2021 years to Russian applicants by federal regions of Russia*

Year	Invention applications	Central Federal Region	Northwestern Federal Region	Southern Federal Region	North Caucasian Federal Region	Volga Federal Region	Ural Federal Region	Siberian Federal Region	Far Eastern Federal Region	Share, (%)
2017	Legal entity	6518	1465	1169	331	2674	802	1686	437	71.6
	Individual	3380	460	491	137	895	262	258	72	28.4
2018	Legal entity	6374	1496	986	333	2410	727	1527	422	69.5
	Individual	3701	479	392	140	914	236	298	89	39.5
2019	Legal entity	2283	870	458	52	1259	426	559	105	71.8
	Individual	1010	291	129	33	419	197	233	40	28.2
2020	Legal entity	5801	1578	905	270	2214	649	1306	334	75.9
	Individual	1810	512	351	94	752	244	313	48	24.1
2021	Legal entity	5393	1439	739	262	1905	646	1144	303	78.8
	Individual	1430	399	282	36	578	177	209	57	21.2

Source: compiled according to Federal Institute of Industrial Property (Russia)

*Annual official publication of the Federal Service for Intellectual Property (Rospatent) 2017–2021

ing the results indicated in the description of the invention; since 2020 fee-free patenting is granted for no more than 10 applications filed during the corresponding calendar year from one subject[2]);

2) there is an aberration between filed applications and granted patents. The number of patents granted to individuals is significantly lower than the number of applications filed. This trend might relate to the low quality of filing applications and the high cost of filing patent applications with third parties. For example, VTB Bank offers the service "Patenting for inventions" with the tariff cost to vary from 45 000 rubles to 115 000 rubles[3].

3) there is a rather large disproportion of patent activity among federal regions. The highest patent activity was registered in the Central Federal Region, the Northwestern Federal Region, and the Volga Federal Region. It might be due to a higher level of innovative development and the presence of higher educational institutions in the districts that received high marks in the rankings; for example, according to RAEX-100[4] rating of the best universities in Russia and the rating of the best universities by QS World University Ranking[5]. Among the regions, the most active in the field of filing patent applications among individuals in 2021 are: Moscow (1318 applications), Moscow Area (559 applications), St. Petersburg (406 applications), Krasnodar Area (150 applications), Rostov Area (135 applications).

It should be noted that according to the registration of orders of the exclusive rights under the contracts, individuals are also active in the process of transferring patents. For the period 2017–2021 years, involving of individuals into a technology transfer process has been

[2] Civil Code of the Russian Federation (Part 4) dated December 18, 2006, No. 230-FZ to be amended on December 5, 2022. Civil Code of the Russian Federation Section VII. Rights to the results of intellectual activity and means of individualization. URL: http://www.consultant.ru/document/cons_doc_LAW_64629/2bb6d57fd429e6c04ee080e73ceef708aa442fc8/ (accessed 20 April 2023).

[3] VTB. Patenting inventions. URL: https://www.vtb.ru/malyj-biznes/servisy-v-pomoshch-biznesu/patentovanie-izobretenij/ (accessed 26 March 2023).

[4] Rating Review. 100 best universities in Russia (2012–2022). URL: https://raex-rr.com/education/universities/rating_of_universities_of_russia (accessed 28 February 2023).

[5] QS World University & Business School Rankings. URL: https://www.qs.com/rankings/(accessed 28 February 2023).

reduced from 25.14 % to 23.95 % within the framework of technology transfer and from 8.33 % to 6.16 % within the host side, although still remains quite significant.

The phenomenon of a high share of patent ownership by individual inventors in Russia was noted earlier by European Patent Office[6]. For example, the domestic top 100 patent holders in 2010–2015 years having largest portfolios of patents included 17 individuals with a total share of the number of patents equal to 44.3 % (Kurakova et al., 2016). Still, universities occupy leading positions in terms of the number of subjects, to be 45 ones, but they are also inferior, at the same time, in terms of the share of patents in the total volume (32.9 %). Among the business sector, 29 companies were singled out in this rating but the share of patents is only 12.9 %.

Considering an international practice, it is worth noting the prevailing number of applications for RIA registration from a business sector in the total volume of applications filed according to the World Intellectual Property Organization, as well as a trend to their evolving. Indeed, the share of applications increased in the period of 2007–2021 from 83.5 % up to 87.1 %. According to data related to 2021 year, the rest applications were submitted from universities (6.1 %), individual inventors (5 %), research institutes and the public sector (1.8 %). Among the group of high-income countries, the majority of published applications were received from business sector entities. Sweden, Japan and Finland were the leaders in the share of patent applications from companies to exhibit 98 %, 96 % and 95.3 %, respectively[7]. It is worth noting that these countries also occupy high positions in the ranking according to the Global Innovation Index (GII)[8]. Of the group of twenty middle-income countries, the share of the business sector exceeded individual applications in only six cases (China, Thailand, India, Brazil, Turkey, and Bulgaria). These data confirm the study by Paul Romer[9], who received the Swedish National Bank's Alfred Nobel Memorial Prize in Economic Sciences in 2018, that only large companies with sufficient scientific and technical potential are able to provide endogenous economic growth.

Thus, substantial innovations and high-tech inventions are mainly generated using a significant resource base and are not a priority for individual inventors. However, advancing their inventive activity is marked by the following externalities:

1) increasing the level of innovation in society;

2) the possibility to get an additional profit (commercialization of innovations);

3) prospects for cooperative interactions between society and organizations in industry;

4) prospects for the transition from individual research to high-tech start-ups including the attraction of additional investments.

"Patent factory" as a reference point in the innovative development | of individual inventors

In order to stimulate and accelerate the diffusion of innovations, it is necessary to create favorable conditions that will promote the society to develop an innovative potential. One of these conditions might be the "Patent Factory" model. The purpose of the factory is the selection and implementation of progressive innovative ideas that meet two major requirements, (i) to offer innovative ideas of high quality, i.e. relevant at the present time and meeting the needs of the market, which could be implemented in a rather short time (ii) the likelihood of a high degree of commercialization. The factory is a kind of attractor and has a modular structure (Fig. 1). The "factory" is understood as a complete process for the implementation of innovative ideas, starting from TRL 1 and ending with TRL 9. In the domestic scientific literature, the term "factory" is employed by the Federal Institute of Industrial Property (FIIP) as the "FIIP Patent Analytics Factory", while

[6] European Patent Office. Patent Index 2021. URL: https://www.epo.org/about-us/annual-reports-statistics/statistics/2021.html (accessed 20 April 2023).

[7] PCT Annual Review 2022. URL: (accessed 20 April 2023).

[8] Global Innovation Index 2022. URL: https://www.globalinnovationindex.org (accessed 20 April 2023).

[9] Romer P.M. (1989). Endogenous technological change. NBER working paper series. URL: https://www.nber.org/system/files/working_papers/w3210/w3210.pdf (accessed 02 April 2023).

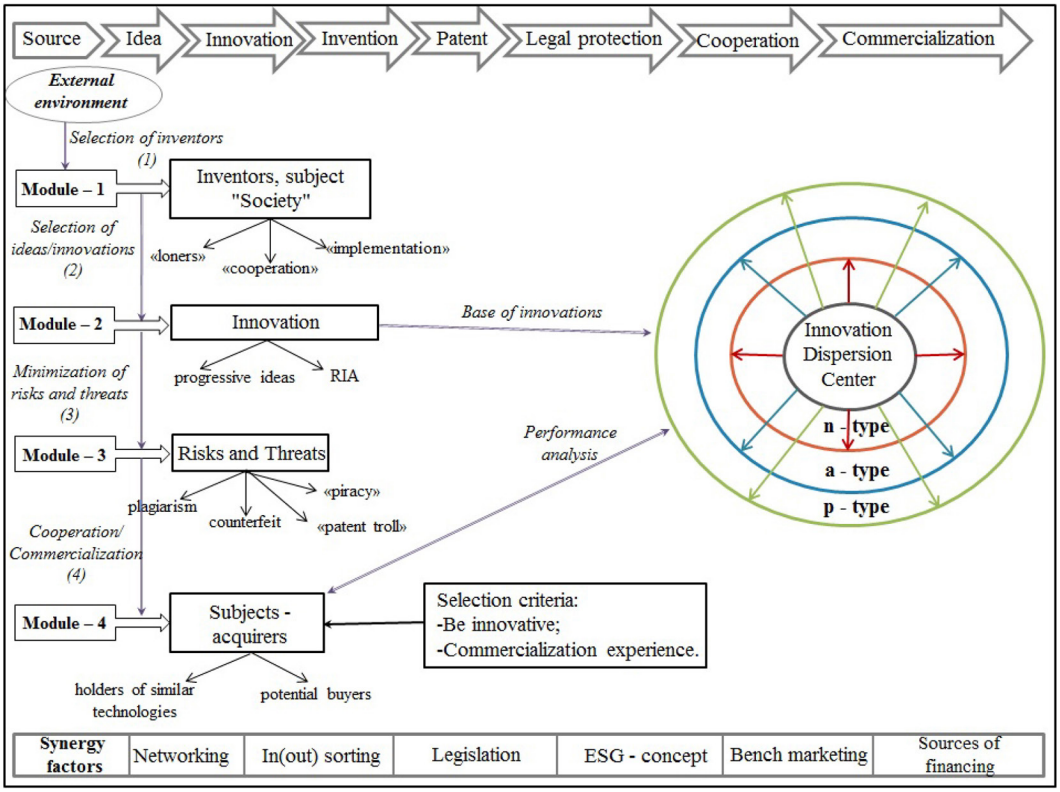

Fig. 1. The model of patent factory

some the authors abroad note it as a tendency to develop the innovative potential of individual inventors (O'Connell, 2008) and as intellectual entrepreneurship (Sennikova & Kurovs, 2006).

According to Fig. 1, the factory operates as follows.

Stage-1: selection of "young" inventors. Any inventor from the external environment offers their promising innovative ideas/developments for further elaboration in the patent factory.

Module-1. After selecting suitable innovations, "young" inventors are classified according to individual characteristics: (1) "loners", inventors who do not need a teamwork, do not show an interest in a cooperation, and generate/reproduce technologies on their own but need guidance, equipment, materials, infrastructure, funding, etc.; (2) "cooperation", the segment of inventors who need to interact with an external environment to get better results; (3) "implementation", the inventors who have clearly articulated ideas or patents, are ready to use them in practice, but do not have a sufficient level of business activity to scale in production. This classification of inventors takes individual characteristics into account and considers building the most favorable business climate based on psychological characteristics of inventors to achieve a maximum effect. It should be noted that the "anchor" in this model is the inventors who have innovative and creative ideas to be the basis for the effective functioning the factory. However, having no practical experience in RIA and transfer, "young" inventors need consulting services. Therefore, inventors fall into two categories: "young" ones who have no experience in bringing innovation to market, and "Serial" ones who have a commercialization experience, have cooperative ties with various economic entities and participate in the factory as mentors and trainers for "young" inventors. "Serial" inventors must satisfy three conditions: (1) the presence

of innovative developments with a legal protection; (2) innovative developments have a high degree of commercialization or the existence of a license agreement; (3) experience in building a successful business (Glukhikh, 2022).

Stage-2: selection of ideas/innovations in various areas – field of activity, type of legal protection, scope of implementation, and possible partners.

Module-2: a differentiation of innovations starting from progressive ideas to existing RIAs and the formation of a common database of innovations. The result of the implementation of the first two modules is: (1) the structuring of innovations, (2) of the determining a "serial" inventor to help "young" ones.

Stage-3: minimization of risks and threats. It is necessary to check the "purity" of the proposed innovations and determine the most effective mechanisms for protection the RIA.

Module-3: risks and threats. Let us consider a direction of risks and threats, to be rather new in a domestic practice, as so-called "patent trolls" which are also called "patent sharks", "patent dealers", etc. in literature abroad. This type of threat is especially dangerous for small businesses and individual inventors who do not have stable positions in the business environment and have a limited amount of cash. The activity of trolling "slows down" innovation processes because their activity aims at illegal profit, and not at the development of innovation. This direction appeared in 1993 and we may note such examples as Kaspersky Lab (Shurtakov, 2016), Samsung, Apple, Google, which became "victims" of trolls. Since 2014, in some states of USA the fight against this patent trolling has begun at the legislative level (Barabashev, Ponomareva, 2021). Unfortunately, at present Russian practice, there are no exact criteria for identifying trolls at the initial stage. Therefore, the factory needs to develop own preventive measures to minimize this type of risk.

Stage-4: cooperation and commercialization. At this stage, an analysis of possible and effective cooperation ties, assessing RIAs and methods of transfer takes place.

Module-4: segmentation of entities that acquire patents depending on two possibilities. The first option concerns acquirers which are doing business in a certain industry to be engaged in related developments. They might be called as "holders of similar technologies". The second options are acquirers which are interested in the early stages of invention (TRL 1 – TRL 4) and contributed to obtaining the RIA. In order to maximize the exploitation of patents, acquirers must meet two criteria: to be innovative and, have a positive experience in the commercialization of innovations.

The Innovation Dispersion Center is designed to analyze the efficiency of the factory. All innovations are divided into three types: n-type (negative) which include innovations whose costs are higher than the profit received; a-type (acceptable) whose costs are equal to profits; and p-type (positive) whose profit is much higher than costs. This classification of innovations let us, (1) to differentiate innovations in terms of efficiency, (2) to form a portfolio of innovations, (3) to develop strategies for the development of the factory based on an analysis of market demands.

The synergy factors or external interfaces are designed to ensure an effective management and to accelerate the diffusion of innovations.

The factory can be implemented in the following ways:

– a separate business unit in industry, universities and other economic entities;
– electronic platform;
– pool;
– individual organization in clusters.

We guess that building a patent factory in clusters is the best option because of a presence of all the necessary subjects for the successful exploitation of the factory while cluster members are ready to implement innovative developments into their activities. Also, clusters are supported by the state under a quite strict regulation.

Conclusions

The imperatives of the new time challenge the conventional paradigm of innovative development which requires using new stimulus and approaches based on the activation of the existing human potential. From this viewpoint, increasing the innovativeness of society is an important task on the way to a technological

sovereignty and the implementation of import substitution projects. The share of individual inventors in patent activity in Russia is quite significant. However, it is inferior to the level of innovatively developed states which consider primarily the development and implementation of breakthrough innovations to be mainly carried out in corporations. In this regard, one of the tasks of innovative development is to create conditions for the transition of the innovatively active layer of society into the business environment. Within the framework of this task, the model of the "patent factory" proposed by the authors can contribute to:

– increasing the quantity and quality of patent applications which will activate their commercialization and implementation in industry;

– enhancing the level of self-employed, which affects the well-being of the population;

– intensifying the inventive activities in society, which can accelerate the pace of technological development of the state;

– creating an adaptive innovation climate, which advances the level of innovation culture.

In addition to the above, these opportunities can activate the innovative development of regions and the country as a whole, which would promote the growth of national income, the investment attractiveness of the country and the competitiveness of local products in world markets.

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